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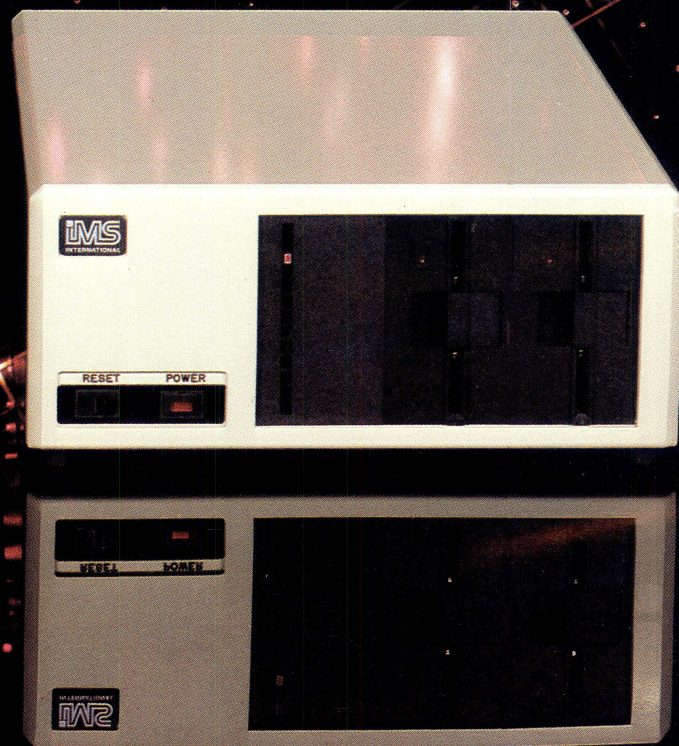
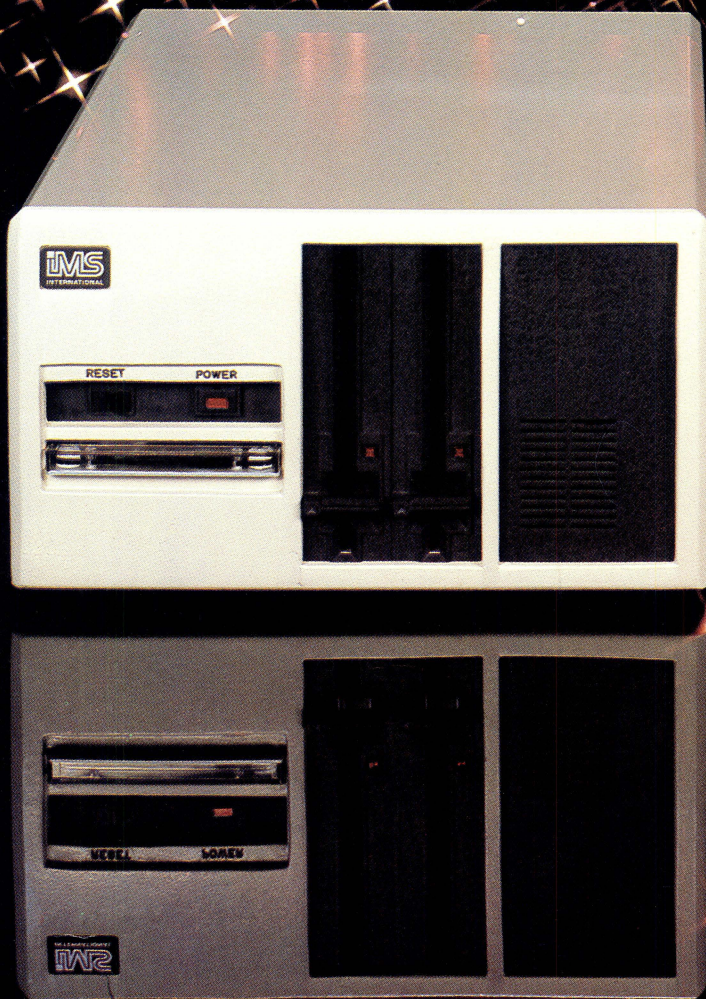
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news

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Your Computer News

Our roundup of the latest in software and hardware, new and upcoming releases and happenings in the world of microcomputers.

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New Zealand Scene

News from Peter Isaac on what's happening across the Tasman.

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Micro Medical

Hospital-based medicine is becoming progressively more micro dependent as scientists, clinicians and administrators note the flexibility, ease and low cost of micro use.

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Express Plans

The eyes of the American Express world are on the company's Australian office, which is experimenting with the use of personal computers to solve several of its number-crunching problems.

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Case History

Our series which looks at personal computers at work, and how they're coping with business life.

For beginners

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Second Hand Rose

What to look out for if you're planning to get into computing with a second-hand machine.

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Understanding Assembler

Part three of our tutorial on 8080 assembly language — this issue, it's time to start programming.

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Basic For Birdwatchers

It's already been labelled one of the best BASIC tutorials ever written, so if you've been missing it, you're missing out. Part seven deals with forms design.

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For Better Or Wirth

Our giant special devoted to Pascal starts here with Les Bell's analysis of the language, its background and its capabilities. He follows up with reviews of the major packages available.

58

Sinclair's Touching Story

Or, are you fed up to here with your thoughts racing ahead of your fingers while programming a ZX80/81? If so, find out how easy it is to add a real keyboard to the mighty mite.

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Care For Your Computer

A little thought goes a long way in avoiding damaged equipment or the often-harder-to-replace lost data. Les Bell has the ideas, if you care to follow them.

76

A Great Plot

A description of, and full listings for, a general pur-

pose plotting program which comes with the right credentials — it was written by a CSIRO honorary research fellow.

reviews

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VIC Power

It's here at last! We take a closer look at Commodore's VIC-20, one of the most popular (and hard to find) new computers around.

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Pascal Progress

As part of our special feature on Pascal, we review: Pascal/M, UCSD Pascal, Super-soft Tiny Pascal and Pascal/MT+.

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Hi-Writing Peach

A newcomer to computing, journalist Allan Moulton picked Hitachi's Peach and Cybernetics Research's Hi-Writer word processing package for his work. He describes his 'initiation'...

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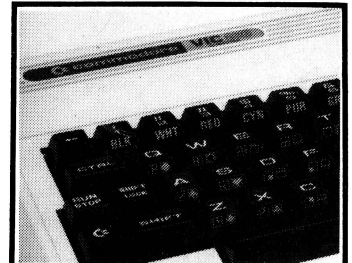
Adventure In Time

From one of the first of many readers who responded to the February issue's story on writing for YC (you'll see a lot more next month) comes this review of the Gloster Software's Adventure In Time

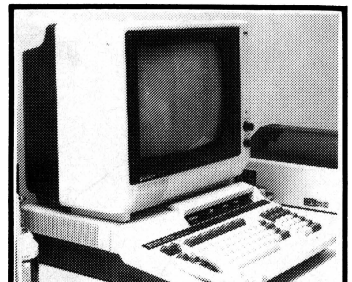
80

More Tandy Colour

... Or how a relative beginner spent the weekend with Tandy's Color computer and its manual. He was particularly impressed with the manual.



Commodore's VIC-20 has taken Australia by storm, despite the delays between announcement and delivery. Were we impressed? Check page 19.



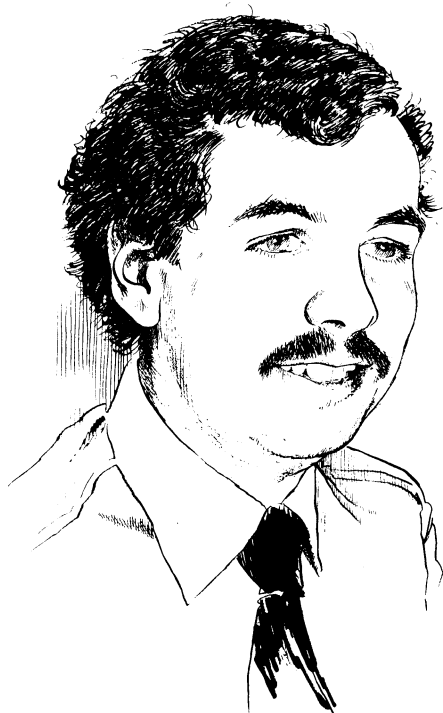
Journalist Allan Moulton has been initiated into word processing with Hitachi's Peach. On page 47 he tells us how it performs, using the locally written Hi-Writer package.

NEXT MONTH!

Giant Pocket Programs Special

Yes, we've been a little remiss, leaving out a wealth of interesting pocket programs submitted by readers. Finding the space is always a problem, but it's time you had a chance to hit your keyboards with all those Apple, Tandy, Sinclair (and others) programs. Watch out next month for our giant Pocket Program special — and each month thereafter for this (almost-totally) regular feature.

editorial



WE'VE been through the era of bigger and better computers; of more memory, faster processors, multiprocessing and the like. The name of the game today is price competition: selling a computer that does the job, at the best price.

So says Dr Adam Osborne, who was in Australia recently for the launch of the Osborne-1 computer.

Buyers aren't interested in fancy features, says Dr Osborne. Most of the time special features don't make any difference to the buyer's application anyway, so if a basic computer will do the job, why waste the buyer's money adding features he won't need?

It would be easy to dismiss this view as another of Osborne's pontifications and sermons. However, you have to admit his batting average has been pretty high, while his own company, dedicated to this concept of providing a no-frills computer, is the fastest growing company in the US computer industry.

Nobody should really be surprised. The electronics industry has made the same mistake many times before — digital watches which took an hour to set up, stereo tuners with inch-thick manuals and so on. In fact with current technology it is easier to make more complex products than cheaper ones; at the same time competition in the market place forces what marketers call 'product differentiation'. The result is a spiral of complexity.

Design engineers fall into this trap particularly easily; they enjoy working with advanced technology, which may not necessarily be appropriate technology.

Osborne is right again. Whatever happened to the KISS (keep it short and simple) rule? ☐

— Les Bell

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your computer news

New Monroe

MONROE Business Machines has released its new microcomputer, the OC8820. Nicknamed 'Monty', the new machine is neat and compact, yet offers 128 Kbytes of RAM and a multi-tasking operating system. The machine, termed an 'occupational computer', is aimed at professionals and small businesses, and is offered with a choice of operating systems.

With the ever-popular CP/M, the machine will support applications packages such as WordStar and Supercalc. Both programs have been modified by Monroe: WordStar to make it friendlier (using program-defined 'soft' keys) and Supercalc to take advantage of the big address space of the new machine, accomodating an extra-large spreadsheet.

The preferred operating system, however, is Monroe's own MOS. This can support up to 12 tasks concurrently, allowing simultaneous data entry and posting of accounts, for example, while printing reports in the background. In addition, MOS will directly support ISAM files.

The OC8820 has a distinctive amber phosphor screen, with four programmable character sets, underlining and inverse video. A row of user-definable keys can be used in conjunction with a keyboard overlay to provide single-keystroke access to functions. Two 13 cm disk drives provide a total of 640 Kbytes of storage. A 5 or 10 Mbyte hard disk will be available by the end of the year.

The system is being sold in Australia by Business Control Systems, best known for its software for the accounting profession (which will be converted for the OC8820).

The machine sells for \$5455 including sales tax, and BCS can be contacted on (02) 233-1302 or at 1 Angel Place, Sydney 2000. □



Twinlock System

BUSINESS equipment manufacturer Twinlock Australia has introduced to its range of business products an advanced desktop microcomputer. It will be sold through Twinlock's established dealer network.

In announcing the move, managing director Chris Seers said the years of experience in solving small business problems with products sold by its dealer network gives the company a major edge in this fast developing market-place.

Called the Twinlock MCS, the system has a 128K byte internal memory, two or three times the size of the most other desk top micros with two disk drives using standard mini disks of 330K bytes per drive. This very large capacity makes the MCS one of the most powerful microcomputers on the market.

Priced at around \$6250, the system is ideally suited to small business applications.

Twinlock will provide a complete package for micro-

based business users. Its existing product range of print-out binders, storage and housing systems is being expanded to include disks, diskette storage, continuous stationery and VDU work stations. The business user will be able to purchase all his support equipment from a Twinlock dealer, including the new microcomputer.

Twinlock will be offering a full suite of software, written and tested in Australia, covering the major business accounting functions. In addition, Twinlock has a unique software package, PIPs (Programming and Information Processing, Simplified), a simple to use problem solving software tool which does not require any programming knowledge by the user.

Contact Twinlock Australia, 4 Brixton Road, Sandringham, Victoria 3191. Tel. (03) 584 4000. □

Special Offer

DUE TO the late appearance of the March issue on the newsstands, Systems User

and Management newsletter has agreed to extend its special offer to new subscribers until the end of May.

Normally sold at \$140 per annum, Systems User is intended for computing professionals and senior management, and is available on special offer to new subscribers for only \$96.

Contact Systems User and Management, PO Box 430, Milsons Point, NSW 2061. Tel (02) 922 3255.

Osborne Visits Oz

INDUSTRY guru Dr Adam Osborne met the press at a function to launch the Osborne-1 in Australia last month.

In a speech intended to give nothing away to his competitors, Osborne revealed little about up-coming products for the O-1, choosing instead to extemporise on the formula which has made Osborne Computer Corporation the fastest-growing computer company in the US (and probably the world).

President Office Machines began distributing the O-1 in

Australia in February, and managing director Tom Cooper revealed the O-1 is already a runaway success.

President has concluded negotiations with IMS in Melbourne to make available that company's range of accounting and business software on the O-1. In addition, the first 1000 O-1s sold will include a free subscription to the Australian Beginning.

For further details, contact President Office Machines, rear 100 George Street, Hornsby, NSW 2077 or phone (02) 476-2700. □

Software Surplus

WHEN Tandy planned to market the Motorola 6809B-6883 circuit in the TRS-80 Color Computer, it gambled on a game-market demanding instant-load ROM PACs.

Tandy lost! The public was smarter than Tandy — people realized Tandy had a tiger.

Over 50 firms began selling cassette programs for that tiger.

Tandy takes some ten months from debugged code to having the PAC on its shelves. As the independent programs became better and better, Tandy kept stopping PAC production to improve them, so Scripsit and Spectaculator (Visicalc look-alike) reached the warehouses later than expected.

Greg Wilson (PO Box 504 Potts Point 2011) has been evaluating the 'independents' since July. By entering into licensing agreements to reproduce in Sydney, he has been able to keep the Australian prices to the American level.

His major problem was convincing the software houses that more programs would be sold at a lower price in a no-frills pack, than at a higher price using their four-colour leaflets and packs.

His catalogue has 'burst' at 200 programs. He will arrange USA mailing of a further 150.

Wilson reluctantly concedes that he can't yet beat Tandy's File PAC, but he has Garry Magnusen (Indiana) adapting his fully-fledged EZYDATA to both Tandy and Exatron (non-stringy) disk systems.

By instant printing of airmailed proofs, Wilson is also offering annual subscriptions to the TRS-80 Color Computer monthly "The Rainbow" for \$A19 instead of \$US44. He abridged Tom Rosenbloom's The Facts by dropping Motorola's data sheets, but still retained the vital annotated source listings of the three Microsoft ROMs.

Motorola has given Tandy another winner with a 68000-based circuit (with a Z80 to read CP/M). These will not be cheap, but they are designed to interact with 'cheap' TRS-80 Color by (\$US149) direct-connect modems, says Greg Wilson. □

Getting 'The Facts'

WANT The Facts for the TRS-80 Color Computer?

Now into its third printing, The Facts was written by Tom Rosenbloom and published by Spectral Associates of Tacoma, Washington State.

From the US it costs \$US14.95, plus \$US8.20 postage. However, Greg Wilson (PO Box 504 Potts Point NSW 2011) has printed an Australian edition, under licence from the US publisher.

This local edition, which comes without four Motorola data sheets, costs \$10, plus \$1 postage. □

New From Sanyo

FOLLOWING the successful release earlier this year of two new micros, MBC 2000



and MBC 3000, Sanyo Office Machines has now released another two models to join its range of computer products.

According to Sanyo's Roger Price, the response to its desk-top computers has been 'tremendous', with 12 installations completed within the first two months of their release.

The new FDS 1000 is an entry level microcomputer which is said to be ideal for smaller business applications and word processing. It features a 4 MHz Z80 CPU, a 30 cm phosphor green screen displaying 80 characters by 25 lines and a detachable keyboard with separate number pad and five programmable function keys.

A single 328K capacity 13cm disk drive can be complemented with three additional 328K drives. The standard printer port is Centronics, and two RS-232C ports are available as an option.

The internationally accepted CP/M operating system enables the FDS 1000 to use the vast range of both Australian and overseas software, as well as languages such as BASIC and FORTRAN. A full range

of business software is available from Sanyo Office Machines in all states.

Apart from its application as a stand-alone small business computer, Sanyo says the FDS 1000 is ideal for use as an intelligent terminal, or as a node in a complete DDP network.

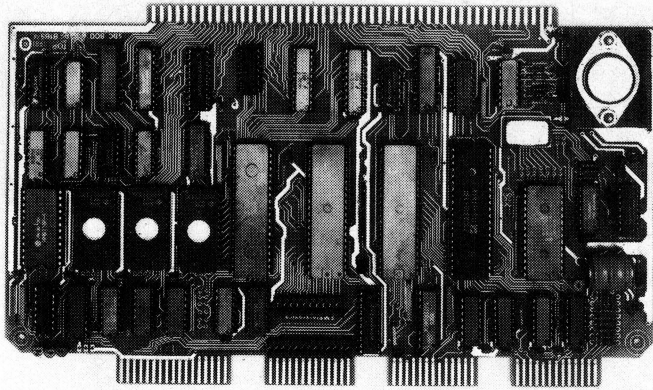
Sanyo's PHC 800 personal computer weighs less than a half a kilogram and measures 18 cm by 8 cm by 2.5 cm.

Despite its small size, the PHC 800 in its basic form uses an 8 bit CPU, 26K of ROM (MBASIC in ROM) and 48K of RAM. Commands from the 64-key keyboard are displayed on the 24 character liquid crystal display, with programs running under Microsoft's BASIC 80. □

Telex Exchange

THE world's largest computer-controlled trunk telex exchange has recently entered service in London.

It will provide Britain with a 30 percent increase in overseas telex capacity through an extra 11,000 lines. These will transmit messages between the UK's 90,000 telex customers and more than a million users in 170 other countries. □



Z80 Single Board

SME Systems of Melbourne, well known for its range of professional S100 computing equipment, has announced the release of a new Z80 CPU card of "unprecedented power."

The new board, which can be used either stand-alone or as the heart of a complete computer system, will retail for under \$500.

"Called the SBC-800, this card presents an impressive array of hardware," says SME managing director Mr Mike Pratt.

Included as standard are two serial RS232C/20 MA current loop ports, three programmable parallel ports, a centronics printer port, software baud rate selection, vectored interrupt handling and a four-channel CTC timer.

A power-on reset, power fail detect and power-on jump features are also included.

"The SBC-800 offers unparalleled computing power and versatility on a single board, offering great potential for OEMs and engineers wanting to build their own systems" says Mike Pratt. "We take great pride in the fact that it's 100 percent Australian designed and built."

The board runs a 4 MHz Z-80 CPU. One of the board's more unusual features is the battery-backed real-time clock and calendar chip. The monolithic device

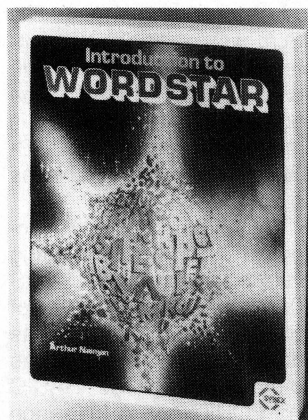
provides the RTC facility without any expense in CPU utilisation, providing facilities such as the generating of programmable periodic interrupts and 12 or 24-hour operation, says Mike Pratt.

There is 2K of CMOS RAM on board and a 4K Monitor and CP/M 2.2 BIOS is available. Two sockets are provided for an additional 4K of CMOS RAM or 8K of EPROM.

For further information on the SBC-800, contact SME Systems at 22 Queen Street, Mitcham, Victoria, 3132. Tel: (03) 874 3666. □

Wordstar Words

SYBEX of Berkeley, California, has announced the release of *Introduction to WordStar*, a book by Arthur Naiman. This is a 'user-friendly' guide designed to teach anyone to use WordStar, a popular word processing program.



Introduction to WordStar is an excellent reference source for anyone who uses WordStar. The book contains a complete dictionary of all the commands used in WordStar, Spellstar and MailMerge. There is a very special feature: every entry includes a diagram of the keys actually used to perform each command. There are also sections which explain how to use WordStar with the Apple II, TRS-80 Model 1 and Heath 89/Zenith 89.

Every item within this book is cross-referenced by subject and command for ease of use.

The book costs \$US8.95 from Sybex, 2344 Sixth Street, Berkeley CA 94710. □

Investment Software

INVESTMENT and gambling software and texts for microcomputers are the specialty of a recently launched South Australian-based company — CompuStat. The manager of CompuStat is regular YC contributor Dr George Phillipou.

With CompuStat's experience in statistics and data analysis, it has been selective in the material carried, says Dr Phillipou.

Programs and text currently available or soon to arrive include such areas as: shares, options, commodities, horse racing, football pools, roulette and blackjack.

Most of the investment software has been written by CompuStat to cater for the Australian market, particularly for shares and options, Dr Phillipou explained.

Texts are chosen so they contain actual program listings (such as Trading Commodities with a Microcomputer) or lend themselves to microcomputer implementation (for example, Beating the Races with a Computer), he said.

CompuStat is at 40 Nedford Crescent, Fulham Gardens, South Australia 5024. Tel. (08) 356 1249. □

OTC Upgrades MIDAS

THE Overseas Telecommunications Commission is replacing its original MIDAS node, located in Sydney, with a new Tymnet 'Engine' which will enable new features to be added to the service with relatively small effort.

OTC believes it will be able to respond more quickly to market demands in a field where technological developments demand adaptability.

The original processor was installed three years ago using equipment also manufactured by Tymnet. But technological developments and market demands have meant the existing processor cannot provide all the facilities that existing and potential users of MIDAS, OTC's packet switching data transmission service, now require.

A major limitation of the present MIDAS service is the inability of Australian databases (hosts) to be accessed from overseas data networks. The consequence of this limitation has been a one-way flow of information into Australia and an inability of Australian information vendors to offer services internationally.

By mid-1982 the MIDAS service will be able to connect Australian synchronous data terminal equipment (DTE) by tie-line using the CCITT X25 LAP B interface at speeds of up to 9600bps, thus enabling the establishment of calls from overseas to Australian host computers.

Facilities will also be provided to connect host computers to MIDAS via tie-lines operating asynchronously at speeds up to 1200bps, thus enabling calls to be directed to these computers. Further development will enable calls

to be established both into and from Australian asynchronous DTE's at speeds up to 1200bps.

A significant feature of the new 'Engine' will be the ability of MIDAS users in Australia to be directly connected to overseas packet switching systems without the need to transit the Tymnet Network in the US. In doing so, service quality will be improved and time delays reduced.

Another Compak Shop

AFTER six months of very active operation at the Compak Brighton Shop, Compak is opening a shop at Dandenong, Victoria.

The new shop is at 81A Foster Street, Dandenong Tel (03) 793 5701).

Compak handles a wide range of different manufacturers' microcomputer products, including Archives, Tandy, Apple, Orange, Hitachi (Peach), and Compak's own CP/M systems, produced from the imported V-10 board.

Compak manufactures power supplies and disk controller for the TRS-80 model 1 and is planning to supply a double sided disk for the Apple in the near future.

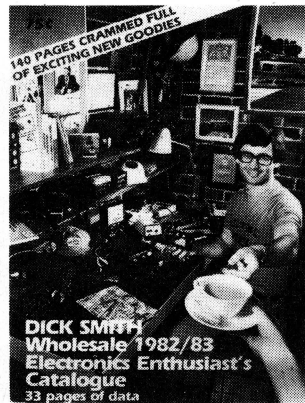
It also specializes in interfacing typewriters as letter quality printers and currently handles IBM Golfball, Olivetti, Adler and Olympia.

The accent at Compak is on business and word processing systems. It sells a wide range of peripheral products. □

Mail Order

DICK SMITH has announced the 1983 release of what he calls Australia's most famous electronic mail order catalogue.

The new Dick Smith Electronics Catalogue has 144 pages crammed full of electronics goodies. There are about 3500 items ranging



from components, hi-fi and telephone equipment to home computer systems.

Also included in the book is a 33-page data section for the enthusiast with broadcasting and television stations, circuit laws, DIN and hi-fi connections, music frequencies, reactance/frequency chart, transistor data, full colour codes and other information.

Copies of the Dick Smith Catalogue are obtainable for 75c at any of the 27 Dick Smith Electronics stores. □

ExecuPlan II Modelling

DICKER Data Projects has introduced ExecuPlan II, a new version of its financial modelling and planning software which offers remote access, new sort and if-then else, logical operator capabilities, and interfacing to programs or data bases written in BASIC, FORTRAN and other high level languages.

ExecuPlan is a 'what if' program that enables users to easily and rapidly develop electronic work sheets for financial, accounting, sales, payroll, manufacturing, inventory and other business operations. Since its introduction, in November 1980, it has become a widely-used tool for financial and business planning, analysis, budgeting and forecasting.

A unique and particularly exciting new feature, one that

moves Vector closer to providing a 'cluster' of applications for professionals and business men, says Fiona Dicker, marketing manager of Dicker Data, is the ability to display and print a worksheet using a high-level language like BASIC and FORTRAN.

Now Vector dealers, or any person familiar with simple programming, can write a custom interface which makes ExecuPlan data models useful in other application programs, and permits data from other programs to be used in ExecuPlan models without conversion, she said.

For example, Dicker pointed out, sales statistics can be accumulated using a data base manager. Selected data can be displayed and manipulated with ExecuPlan II and printed out as part of a final report using Vector's Memorite III word processing.

Vital information is stored and examined, decisions are effectively and quickly made, and reports and proposals are professional-looking and timely, she noted.

Dicker said another new and extremely useful feature of ExecuPlan II is a remote access command which retrieves data from another ExecuPlan model stored on disk and automatically inserts it where desired into the plan in process.

"For example," Dicker said, "if a user wants to call 'Retained Earnings' data from a previous plan for use in a new 'Income' plan being worked on, a single command transfers the data, doing away with recalculation, reducing the possibility of errors and cutting the time involved."

ExecuPlan II operates on all Vector microcomputer systems and the newer multi-user Winchester disk systems such as the 5005 and 5032.

Cost of ExecuPlan II is

\$150.00, from Dicker Data Projects, 78 Captain Cook Dr, Caringbah, NSW 2229, Tel. (02) 525 2122. □

Vector M-200 Printer

THE Vector M-200 Printer is a high performance serial matrix printer designed for use with Vector Multishare systems where fast printer throughput is important.

With a print speed of 340 characters per second, the M-200 prints an average of 200 lines per minute. It is ideally suited for use with any Vector systems requiring a high performance printer to generate reports for various business accounting and data processing applications, and may also be used as an extremely fast draft printer in word processing applications.

It offers both the low cost of a quality matrix printer and the high performance characteristics of a line printer.

The Vector M-200 is a bidirectional, logic-seeking printer. A 14-wire dual column head combines the speed of multiple heads with the simplicity of single head.

With an expected life of more than 300 million characters, the head is virtually maintenance free and is easily replaced by the operator in minutes.

Using a 7x7 half dot matrix font, the M-200 features a full character set of 96 ASCII characters plus 32 commonly used international symbols. The normal printing pitch is ten characters per inch. □

BCS Moves House

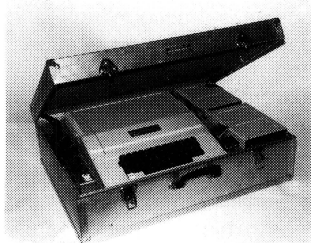
INCREASING problems with parking, transport and delivery have contributed to the decision by Business Control Systems to move its head office from Melbourne's St Kilda Road, to Brighton.

BCS is national distributor for Monroe calculators and

computers; and distributors of office products from Texas Instruments and ADE, and DORO dictation equipment. The new address is 75-79 Bay Street, Brighton, Victoria 3186. Tel. (03) 596 6366.

BCS managing director Mr John Braim said the premium on parking had made it difficult for clients to visit or leave equipment for service, for trucks to make deliveries, and had added greatly to staff costs in the purchase of off-street parking.

The high rise building had also posed security problems, Mr Braim said. □



Computer Case

COMPUTER Force of Sydney has introduced the first of its range of accessories for the Apple II, the Computer Case. It is a robust, shock resistant carrying and protecting case which has been moulded internally to suit an Apple II microcomputer and its accessories.

The case encloses two disk drives, one box of diskettes, game paddles, and a number of cables and manuals. Dimensions are: 70cm by 50cm by 22cm. Price is \$250.

The case is made of aluminium and stainless steel. It will withstand a considerable amount of abuse and is dust-proof and water resistant. The moulded interior holds the computer and accessories securely in place. The latches lock for added security.

Contact Computer Force, PO Box 409 Artarmon NSW 2064. Tel. (02) 95 5624. □

More Atari RAM

BOARDS offering 48K of RAM for Atari 400 computers are now available in Australia.

The board manufactured by Intec of California, upgrades the Atari 400 to full 48K RAM, making it compatible with Atari 800 programs. The 48K RAM board replaces the existing 8 or 16K RAM boards in the 400, thus avoiding the need to add on externally.

The boards, which carry a twelve month warranty, are distributed by Computer Entertainments, 8 Douglas Street, Fannie Bay, Northern Territory 5790. □

HEATHKIT Supports CP/M

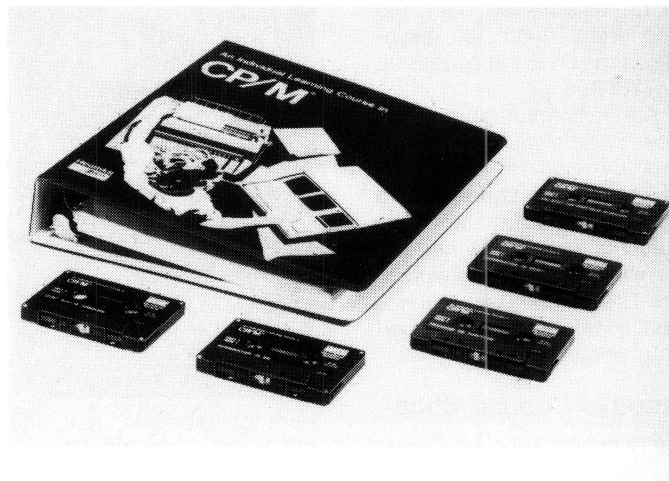
HEATHKIT/Zenith Educational Systems has announced a new course covering uses of the industry-standard CP/M microcomputer operating system.

Designed for first-time computer users, no previous background in CP/M or knowledge of assembly language is necessary to take the course.

According to a company spokesperson, the course is designed to help people obtain the most from CP/M by teaching how to operate CP/M-based applications programs and use the CP/M editor to create and manipulate text files.

Written in an audio-tutorial format, the course includes a 500-page self-instruction text and five audio cassettes. Version 2.2 and earlier versions of CP/M, including built-in and transient commands, are covered in the ten units of the course.

Among the subjects covered in the course are the writing of basic commands; diagnosing causes for error;



using the Console Command Processor (CCP) transient programs; using the STAT and CONFIGUR commands; using the Peripheral Interchange Program (PIP) to transfer files from one disk to another; using ED (CP/M's text editor) to edit and manipulate files, and to create and use combined commands; and submitted command files with the SUBMIT and XSUB commands.

The CP/M Operating System Course can be used with Heath and Zenith Data Systems Microcomputers, or with any 8080, 8086 or Z80-based microcomputer capable of running CP/M.

For more information on this Heath/Zenith education course, as well as a full list of courses covering computers, electronics and mathematics, write for a free catalogue to your local Warburton Franki Office. □

Ampex Terminals

STC Computer Products Division has made a new entry into the hotly competitive market for general purpose video display terminals, as a sole Australian distributor for Ampex display terminals.

Ampex Corporation, headquartered in El Segundo,

California, pioneered data storage and transmission as maker of sound and video tape recording machines and materials. In recent years the company has expanded into video display terminals and other computer-related products.

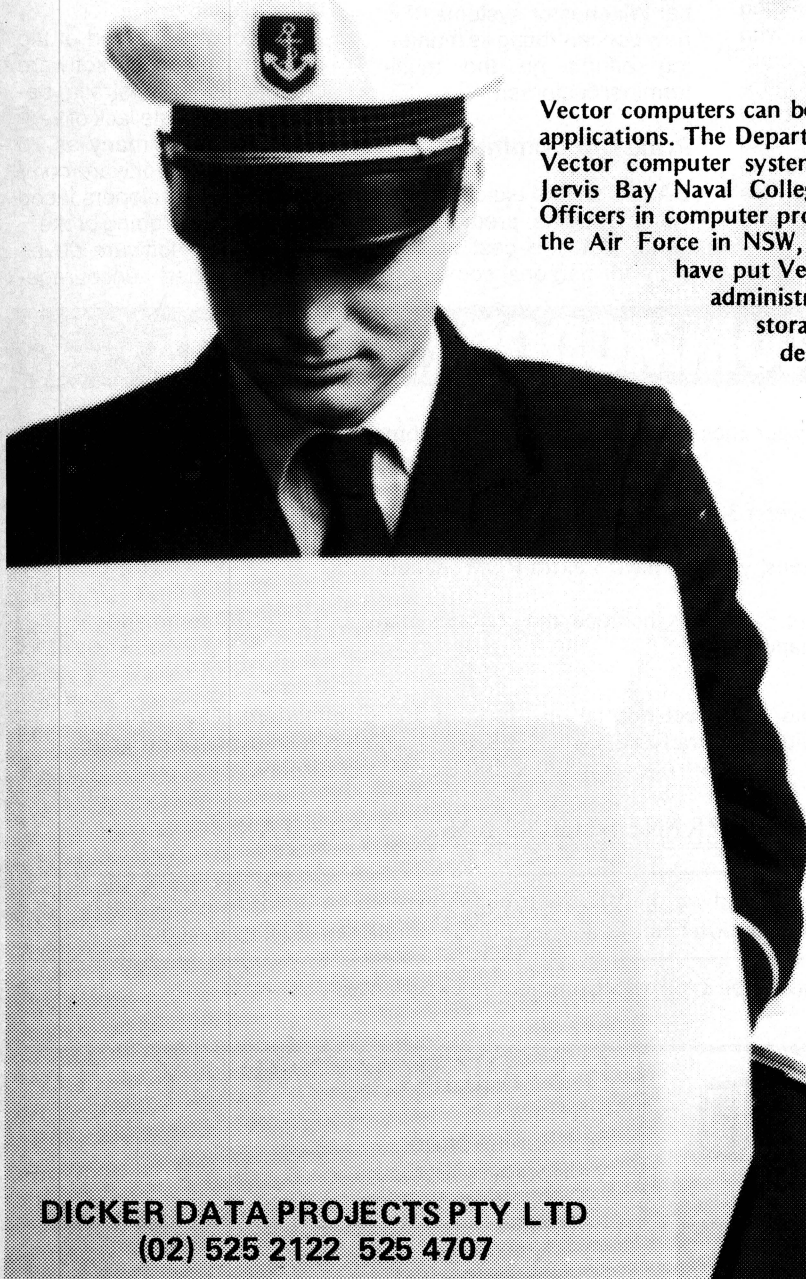
Initially, STC Computer Products will distribute the Ampex D80 editing terminal and the D30 conversational model from its new sales office at 80 Mount Street, North Sydney. Tel. (02) 438 4977.

End user prices will be in the region of \$1400 for the D80 and \$999 for the D30, with progressive discounts for quantity buyers. Both models have been introduced within the past year in the USA. Further models are expected here late in 1982.

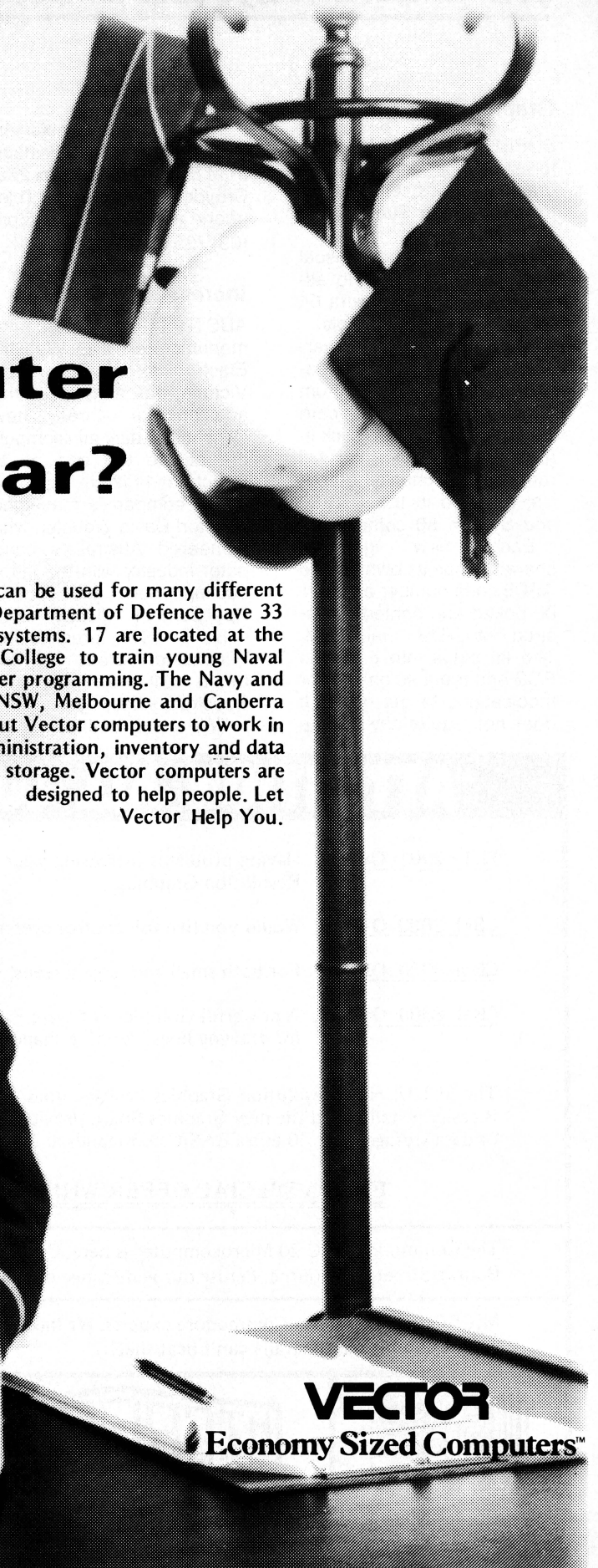
The Ampex display terminals offer detached keyboards and 1920-character 30cm screens on all models.

The simpler D30 offers full ASCII keying, monitor display of all codes, automatic self-test, status line and standard printer port. The D80 offers editing by character and line, protect mode using half-intensity, multiple video attributes, 20 programmable functions and block mode allowing sending line or page as desired. □

How many *hats* can a **VECTOR** computer wear?



Vector computers can be used for many different applications. The Department of Defence have 33 Vector computer systems. 17 are located at the Jervis Bay Naval College to train young Naval Officers in computer programming. The Navy and the Air Force in NSW, Melbourne and Canberra have put Vector computers to work in administration, inventory and data storage. Vector computers are designed to help people. Let Vector Help You.



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Graphics Mod Kit

SUPER 80 users will be interested in a new low cost graphics modification kit for the Dick Smith Super 80 kit computer.

In addition to the usual characters, this easy to assemble kit gives an extra 64 versatile graphics symbols.

The kit comes in two versions: Kit 1 provides 64 special symbols ranging from large 'block' symbols, card suits and fine lines to stick figures; Kit 2 gives the full range of 64 'chunky' graphics, as used in the TRS-80 and System 80 computers.

Each new graphics character has its own unique ASCII code number and can be poked and printed as desired onto VDU or into RAM. The kit plugs into the main PCB and requires only minor modifications to get going. It does not require any change

of ROM.

The kit is available for \$39.50 plus \$2.00 postage from El Graphix PO Box 278, Croydon, Victoria 3136. Telephone enquiries, after 7pm (03) 725 9842. □

Increased Spectrum

AUSTRALIAN computer manufacturer D. D. Webster Electronics, of Bayswater, Victoria, has announced the addition of three new Winchester disk minicomputers at the top end of its Spectrum-11 family.

The company's managing director, David Webster, who pioneered Australia's computer industry with the introduction of his small Spectrum-11 floppy disk minis in 1977, predicts the Winchester group in his range will now dominate Spectrum sales.

"We anticipate that 80 per-

cent of our orders for 1982 will be for Winchester machines and are aiming for a sales target of at least 200 by next December, he said.

In September last year, with nearly 300 floppy disk Spectrums installed throughout Australia, Webster Electronics launched its first Winchester computers, Spectrum HC (\$12,500) and Spectrum GC (\$15,500) which store 8.5 and 30 Megabytes respectively.

Since then, the company has received orders of over \$850,000 for 65 of these initial Winchester systems. It is now concentrating its marketing efforts on the multi-terminal customer. □

Price Dip Coming

DATEC's chief executive, Mr Harry Douglas, predicted recently that the cost of software for personal computers

will be cut in half within three years.

Mr Douglas, head of Australia's leading privately owned software group (annual turnover \$8m), told the Australian Software Show case seminar that the cost of software products for personal computers could be expected to dip to an average of \$100 per unit.

But while personal owners would benefit greatly, software companies and suppliers of personal computers would face decades of failures, piracy and extensive rationalisation.

Mr Douglas warned of the problems faced by software companies in Australia because of an acute lack of venture capital. As many as 70 percent of the software companies and developers faced the prospect of going broke.

Australian software developers needed encourage-

ATTENTION ALL COMMODORE OWNERS

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CBM 8000 Owners: A powerful Graphics Software Package is included and contains many extra BASIC commands for drawing lines, defining shapes, etc.

The M.T.U. High-Resolution Graphics Package does not affect normal operation of any Commodore. The Hardware is easily installed and the new Graphics Board provides 5 extra ROM sockets, 8K RAM which can be used for program or data storage, over 40 extra BASIC commands and full control over a 320 x 200 Dot Matrix display.

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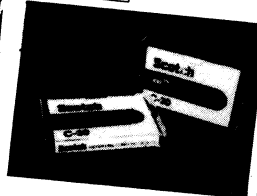
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ment from government as well as from the private sector, he said.

Government preferences for buying local products, off-set programs and taxation and investment allowances should be encouraged.

"Not many people realise that the US domination of the world computer industry was brought about largely as a result of the buy-American Act, which gave substantial price advantages to local goods," said Mr Douglas.

"Japan is another country that has shamelessly pursued a policy of local preference in building up its high technology industry."

More burgeoning Australian companies should be encouraged to go public to raise venture capital, he said. □

Ohio Colour Graphics

THE TCG Group, Australian distributors of the Ohio Scientific range of micro-computers, has launched high resolution colour graphics to the home and business market. Using the Ohio C8P-DF dual floppy disk video system, which can be hooked up to a colour television set, homes users can gain sophisticated colour facilities and above average computing power, according to TCG.

The system provides 16 colours with a resolution of 512 by 256 points, enabling smooth graphlines and curves. It has already been

up and running in business applications for some months.

Optional facilities include dual sided disk drives, high speed processor and memory, voice output synthesiser, remote control security system for home or business, and assorted research and development boards.

Available software includes nine educational disks, with topics ranging from geography and maths to speech therapy; ten games disks, each containing about seven intricate games from starwars to golf and etch-a-sketch; and a variety of standard business packages with word processing, inventory, accounts payable and mailing lists.

The Ohio C8P-DF operates under two powerful operating systems and will respond to direct BASIC and machine language. □

Alpha Micro

WINCHESTER drives and a variety of new data back-up devices are features of the totally new range of Alpha Micro equipment for 1982

The new equipment covers three separate disk size business systems and three types of data back-up devices. While all featuring Winchester drive technology, the new Alpha Micro business systems now come in three disk sizes, to suit all applications from the smallest user to the largest.



The three new systems are:-

- AM-1201 with 8.5 Mb 20cm Winchester drive,
- AM-1041 with 32 Mb 20cm Winchester drive,
- AM-1061 with 60 Mb 35cm Winchester drive.

Specially suited to the needs of the small business, the AM-1021 offers low cost data storage with significantly greater storage capabilities than floppy based systems.

The new Alpha Micro equipment is available from a network of dealers throughout Australia. □

Micros From Digital

DIGITAL Equipment in Australia and New Zealand has announced four new micro-computer kit offerings and substantial price reductions for its LSI-11/2 and LSI-11/23 products.

They are kits comprising all the hardware, operating system, memory and external storage which allow customers to build their own compact systems at prices which show a 30 per cent saving over loose piece prices.

The basic building block is the VT103 video terminal, a powerful updated version of the popular VT100 video terminal of which 250,000 have been installed throughout the world.

The VT103 has a full 4 by 4 LSI-11 backplane and sufficient power reserves to drive CPU and I/O boards.

Offering of these products in the kit form represents a new strategy for Digital. They present a challenge for Digital's OEMs to integrate the parts into a complete unit and offer a compact, economical system in the \$10,000 price range as significant discounts are being offered for volume purchase.

Digital also makes these products available at substantial discounts to qualifying non-profit end user customers with sufficient technical capability to assemble their own microcomputer

systems.

The kits build up into compact, powerful table-top mounted systems with video terminal, dual drive, double density 20 cm floppies, optional dual drive, random access tape cartridge mass storage, the RT11 real time operating system and BASIC-2, to give unsurpassed performance in micro-computer applications.

For further information contact Digital Equipment Australia, Chatswood Plaza, Railway Street, Chatswood NSW 2067. Tel: (02) 412 5252. □

DECset System

DIGITAL Equipment Australia of Sydney has announced DECset, a computerised information management system designed to integrate publishing into a company's office automation strategy.

According to David Mawson, Publishing and Broadcast Industries group market manager, "in-house publishing has traditionally grown outside the needs of the office. With the DECset system, we are demonstrating how important a role integrated publishing plays in managing information and making the office more productive."

The DECset system runs on Digital's popular 32-bit VAX computer. Supported by the VAX's VMS virtual memory operating system and by DECnet (Digital's networking software which permits communication between Digital systems) DECset provides users with the ability to integrate word and data processing with publishing functions such as phototypesetting.

"Computers have automated many functions within companies; yet, to date, no-one has devised an integrated system to automate the printed word. With information costs soaring, we believe company departments are now looking for solutions which efficiently integrate all

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The Verbatim approach is superior to and less expensive than other cleaning disks presently available.

The kit, available in 8" and 5 1/4" sizes, differs from those already available in the marketplace in the following ways:

- The Verbatim cleaning disks are disposable. This approach allows a fresh clean disk to be used each time. No accumulated debris from previous cleanings comes in contact with the heads.
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their office automation tools," said Mawson.

Prices for a basic software-hardware combination start at just under \$250,000. DEC-set software is available for immediate delivery. □

Bondi And VIC

BONDI Junction, the retail centre of Sydney's Eastern Suburbs, is the site of Dick Smith's latest electronics store.

The new store is located on the corner of Adelaide and Oxford Streets and stocks over 3000 items!

Dick Smith Electronics has everything from components for the electronics enthusiast to kits for the enthusiastic beginner, plus electronic games and home computers.

The manager of this new store is Steve Isaacs.

Of course, you know Dick Smith Electronics is now selling the Commodore VIC 20 Colour Computer.

The VIC 20 is one of the first of the new breed of personal computers which gives you a choice — the choice of game machine or computer in the one machine.

The VIC 20 is a keyboard style computer that comprises all the most wanted features in a small, well-presented package.

The main unit comprises a keyboard unit alone. This includes a full standard keyboard, four function keys and connectors for cartridges or add-on memory modules, joy

sticks, lightpen interface, cassette interface and a serial disk drive cum printer interface.

With 20K ROM and 3K RAM (5K including screen), the VIC 20 provides full colour graphics plus three tone generators for sound, including 'white noise' generation for special effects.

The VIC 20 is priced at \$399. □

Pocket Floppy

HITACHI is either particularly serious about making inroads into Australia, or regards us as a good test market — whatever the reason, we're getting first pick of the company's products.

In fact, we'll get Hitachi's latest 'breakthrough' — a 7.5 cm (3 inch) mini-floppy diskette — before anyone else in the world, including the Japanese.

The new diskette, nicknamed the pocket floppy, comes in a protective plastic case with stainless steel 'shutters' to protect the media surface when it's out of the drive.

Hitachi distributor Delta Semiconductor Peripherals says the new diskette is more reliable than current floppies, yet less expensive.

Delta's John Miller says it is about the size of a pocket diary, yet can store up to 500K bytes. The correspondingly small drive size means more machines can have disk systems built-in.



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ZETU Cassette Based Assembler and Program Development Package

ZETU is a full and complete cassette based two pass Assembler. If you are one of the many users unable to afford the expensive (and disappointing) DEVELOPMENT ROM PAC, then ZETU is for you! The ZETU package includes a comprehensive EDITOR and comes with a 20 page operating manual. You will find ZETU reliable and simple to use. Requires 16K

ROM PAC: \$99.00
CASSETTE: \$29.95

BASIC PRE-PROCESSOR

by Geoff Brown Requires a disk drive CP/M and CP/M basic.

Imagine writing your Basic programs without line numbers!

In most big expensive BASIC systems, line numbers are not required. However, a program line may begin with a descriptive word so that it can be referenced by a GOTO or GOSUB statement using the same label. For example, instead of having to remember that a certain subroutine starts at line 4320, we now simply give the subroutine a name such as 'NUMBER' and write "GOSUB NUMBER" instead of 'GOSUB 4320'.

BASIC PRE-PROCESSOR allows you to have this facility with your own disk BASIC! \$24.95

ARITHMETIC TUTORIAL

by Peter Aird. Age 5—Adult. Requires 32K.

Arithmetic simulates the solving of problems on paper by entering from the correct column and by allowing the entry of 'carries' and 'working out' to be entered on the screen. On completion, a full report card is issued showing which routines and levels were used by the student and the marks achieved. The student may 'quit' at any time or continue into extra problems and accumulate his score or perhaps improve his percentage result.

Now you have the ideal excuse for having a computer at home! \$24.95

SPELLING TUTORIAL

by Don Williams. Age 5—Adult. Requires 16K.

How many hours have you spent drilling young children on spelling in preparation for tomorrow's test? Now you can let your Sorcerer take over!

Spelling tutorial comes with two modules. One for you and the other for the child. The first module asks you to type in the words and speak them into the microphone of your cassette recorder. The computer controls the recorder via the remote control jack. The second module asks the child to listen to the tape, hear the spoken word and type in the correct spelling! When the test is over, the correct spelling is given and a score sheet is printed. The child may continue with another test or leave the score sheet on the screen.

Spelling tutorial has been written in such a way that even young children are able to load and operate the system without adult help. \$19.95

MORTGAGE AND LOAN ANALYSIS

by Appollo. Age 15—Adult. Requires 16K.

This program allows you to compare various mortgage amounts, interest rates and mortgage lives. The program calculates and displays monthly payments and total repayment of interest. Each mortgage amount will be calculated in combination with each interest rate and mortgage life, which you have requested. This program may also be used to calculate other types of loans. You may enter any principal amount with any interest rate and calculate the payment and interest amounts for any specified length of time. \$19.95

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VIC Power-



Here At Last!

The home computer market is hotly competitive, and it's one which requires advanced features at a low cost. With the machine finally available in some quantity, LES BELL has taken an in-depth look at Commodore's entry in the market — the VIC-20.

YE GODS, this thing sells for only \$400, yet it has more legends on the keys than anything I've ever seen before!

Can this tiny box really contain that many functions/features?

My test-drive VIC arrived in a neat package from Dick Smith Electronics. Upon unpacking it, I just plugged in the power supply and television monitor, and switched on. So neat, so simple!

I remember in the good old pioneer days when we used to have to switch on the soldering iron, read the manuals and... Ah, the good old days — nowadays it's all too easy!

The VIC's display defaults to a white rectangle with a green border and the characters type in blue. There are 23 rows of 22 columns; not many if you're used to a professional 80 by 24 screen, but still quite a bit to cram onto a colour television screen — particularly through an RF modulator.

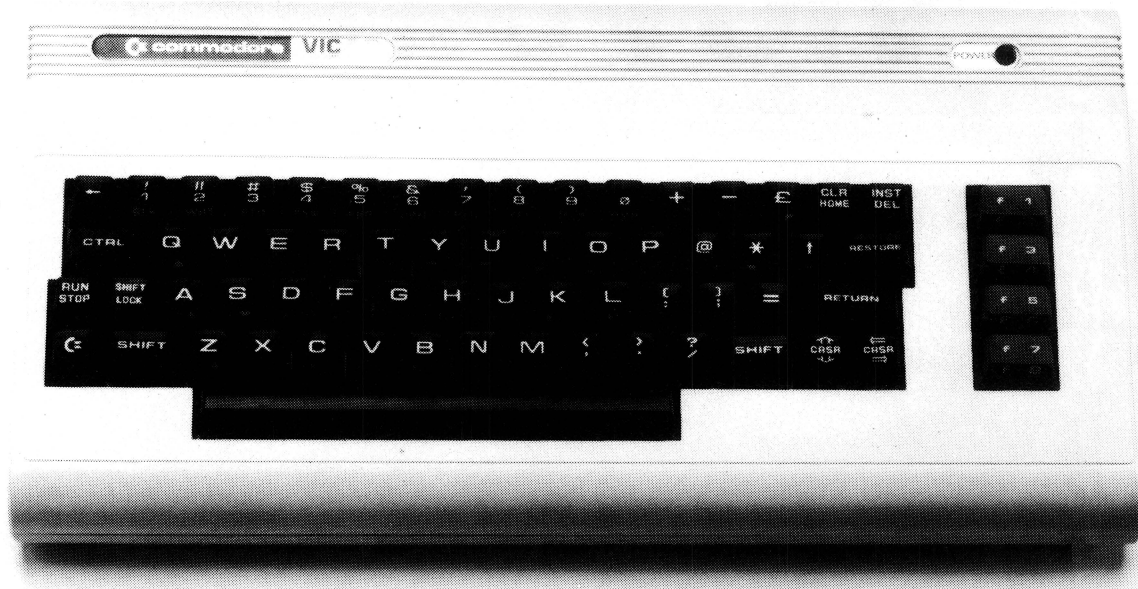
Due to the definition of a colour screen, you can't fit many characters on a line; if you want more characters, it's at the expense of readability. In this case, I think Commodore has made the right choice.

BASIC logs on with the message 'CBM BASIC V2', then announces that there are

3583 bytes free and it's ready. This is more like the old days — back when memory was expensive and an 8K machine was big. In these days of cheap memory the 3.5 Kbytes of the VIC does tend to cramp your style.

Commodore refers to the VIC as a 5K machine. Well, yes, it does have 5K of RAM; but 1.5K of that is taken up with the screen and internal working variables such as the real time clock and colour attributes.

By using a Super Expander Cartridge, you can add another 3K (plus some ROM functions), but beyond that expansion is through a Master Control Board. Why not allow the memory to be added inside the machine, a la Apple and CBM? I think in this case, Commodore has made the wrong choice.



Three's Better Than Zilch!

Still, you can achieve a lot in only 3K, and it is a tremendous improvement over the zero K you probably had before! In writing short programs to try out the VIC I confess I haven't run out of memory yet.

The secret of the VIC's low price is the use of large scale integrated circuits to reduce the component count. However, the use of these ICs has added extra capabilities, particularly in the input/output area.

The heart of the VIC is the 6561 Video Interface Circuit. This one device controls the colour display (including positioning and number of rows and columns), as well as providing three channels of music and one of white noise. It also provides a light pen input and two potentiometer sense inputs (used for paddles or joystick). This is a heck of a lot on one integrated circuit!

The VIC also uses two 6522 Versatile Interface Adapters. These are used to decode the keyboard and provide the cassette interface, a real time clock, a parallel user port, joystick input, serial interface, RS232C interface and a few other miscellaneous functions. Altogether, this means the VIC has more input/output per dollar than anything else on the market.

Commodore has been very cunning in the way its used some of this I/O. For example, the serial interface is used to connect to both a printer and a disk drive, leaving the expansion bus free for additional memory and interfaces.

But back to the software. VIC BASIC is essentially the same as that used in the PET and CBM machines. This means the VIC can take advantage of the existing software base for those machines. Of course, that software won't include colour commands but, as Andrew Peacock may yet discover, you can't have everything!

As BASICs go, VIC BASIC is pretty good. It's really Microsoft 8K ROM BASIC and includes all the functions you could want on such a machine. There's a complete set of trigonometric functions (for trigonometes?), string functions, TAB, POS and all the rest. Very much standard Birdwatcher-type BASIC.

An attractive feature of the VIC is (and here it is similar to the PET and CBM) it uses buffered cassette I/O, allowing sophisticated use of cassette files. Few other machines have this facility. It means the VIC owner can stave off the need to buy a disk drive for longer than most computer owners.

Commodore's Graphics

The VIC's graphics capability is good; it is compatible with the earlier Commodore machines and includes line segments, card suit symbols and other indescribable shapes. There are eight foreground colours: black, white, red, cyan, purple, green, blue and yellow. The background

can be one of 16 colours including orange, light orange and pink.

Being a person who forgets the numbers associated with the colours, I was glad to see Commodore has avoided that problem by labelling the top row of keys with the colours.

The keyboard carries the complete set of graphic symbols, hence the complex-looking keyboard. The VIC can display upper and lower case with a clean and handsome character set. By pressing the SHIFT and COMMODORE keys together, you can shift between the graphics and upper/lower-case modes.

There's also those three sound channels to play with, either for music or sound effects. The manual sensibly provides both a table of musical notes and 20 sound effect listings (ranging from a phone ringing and wind to a UFO landing.)

The keyboard felt quite solid and was easy to use. At the VIC's low price I expected the keyboard wouldn't be too hot: I was pleasantly surprised. The display is tolerably easy to read, though you should



pick your colour combinations with care — it's easy to end up with unreadable text or a screen that looks like the proverbial dog's breakfast.

The C2N cassette recorder behaved well; loading of programs was easy and painless (not like the good old days!). As we were using a video monitor and not a television, we were unable to check out the sound effects, which are modulated onto the video signal.

The display is shown to best advantage on the Super Slot poker machine emulation program. Here, the high resolution graphics portrayal of spinning wheels is excellent. As an avowed anti-pokie freak (dates from my spell as a barman), I didn't really get off on the game, but the graphics

impressed me. I get the impression the VIC hardware is capable of much more than its ROM firmware allows it, certainly at the BASIC level.

Excited, But Lacking Basics

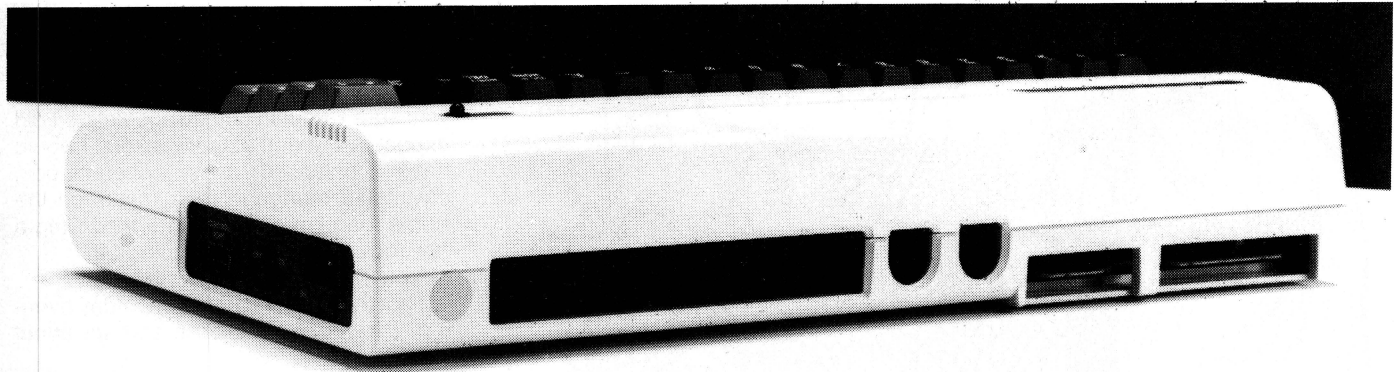
The strong graphics/game-playing/fun orientation of the VIC is pointed up in its user manual. The accent here is on using the unique features of the VIC right from the beginning, leaving the boring aspects of learning BASIC for later. In fact, BASIC programming isn't introduced until the end of the manual, leaving the reader rather excited by the possibilities but a bit short on the basic skills required to write programs.

The manual acts as a showcase for the

machine and an introduction for the absolute beginner. For those who want to be more serious there's the VIC Programmer's Reference Guide, as well as the VIC Learning Series, a set of books and tapes/cartridges which introduce programming concepts.

Overall, I was impressed with the VIC. As a home computer it has all the features required to keep kids amused for hours — colour, graphics, sound, easy-to-use BASIC (did I say that?), a full keyboard; and it's inexpensive. It has plenty of I/O capability, and more memory can be added.

Our review sample was supplied by Dick Smith Electronics and is available from all Dick Smith stores. □



Specifications and Report Card

Unit:	VIC 20
Made By:	Commodore
Processor:	6502A
Clock Speed:	1 MHz
RAM:	5 Kbytes standard
ROM:	8 Kbytes standard
I/O:	Games device port, Cassette, Serial, RS-232C
Languages:	Modified Microsoft BASIC
Keyboard:	Full-size qwerty layout
Display:	23 rows × 22 columns, PAL colour
Graphics:	High-resolution, defined graphics keys
Peripherals:	Cassette, disk-drive
Expansion:	By RAM packs to 32 Kbytes and by ROM packs
General:	8 colours (16 background), 3 music voices, volume control register, external power supply and RF modulator.

VIC and the Office Idiot

By A. Moron

NOW that everyone in the YC office has their Bell University PhD in Computer Science, they've run out of Office Idiots and have taken to accosting innocent bystanders (like me) to prove their superiority in things electronic.

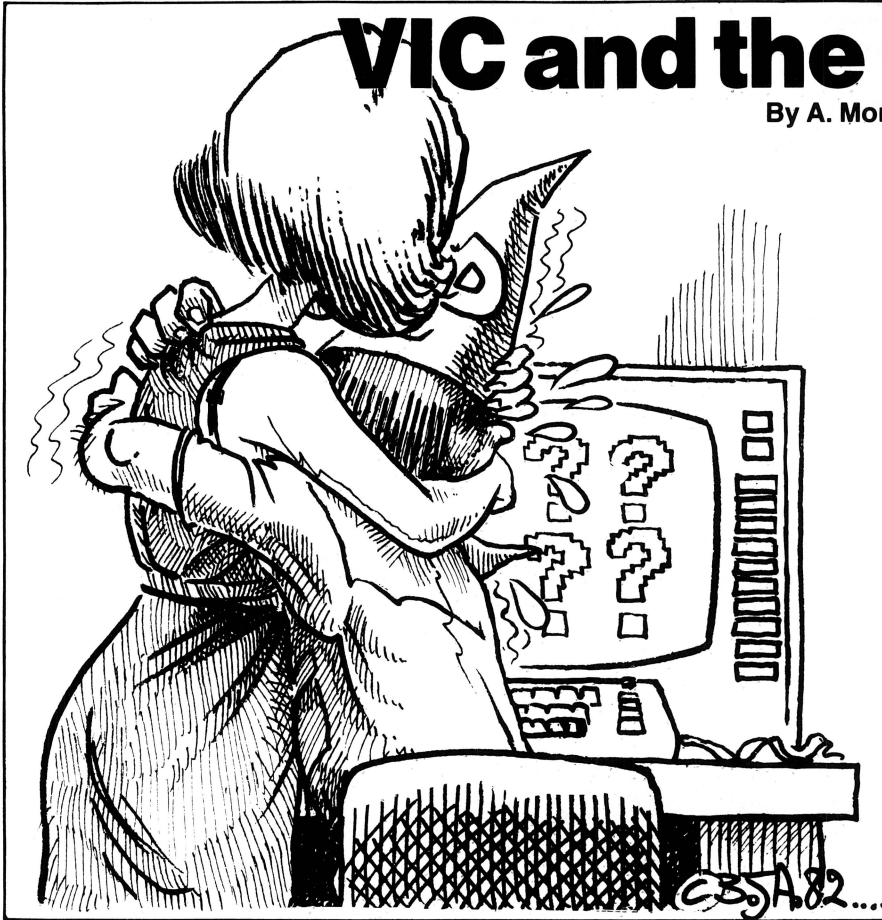
So it was that I had a VIC thrust into my sweaty palms for a weekend of play. It came with urgings to "try it out... see what you make of it... write a few words about your experiences... you know the kind of thing".

Now, in my everyday boredom the nearest I get to computers is reading a stack of sales reports every month. These reports sure as hell don't come from a VIC (well, I don't *think* they do) so I felt myself ideally qualified for the job.

I didn't have high expectations for my first tangle with a personal computer so I was sure I wouldn't be disappointed. I did expect by the end of the weekend I would have balanced my chequebook, calculated mortgage repayments on the home loan I'm planning and tried filing a few recipes — just the simple stuff.

You live and learn, don't you?

I got the machine home on Friday evening, carefully unpacked it and set about



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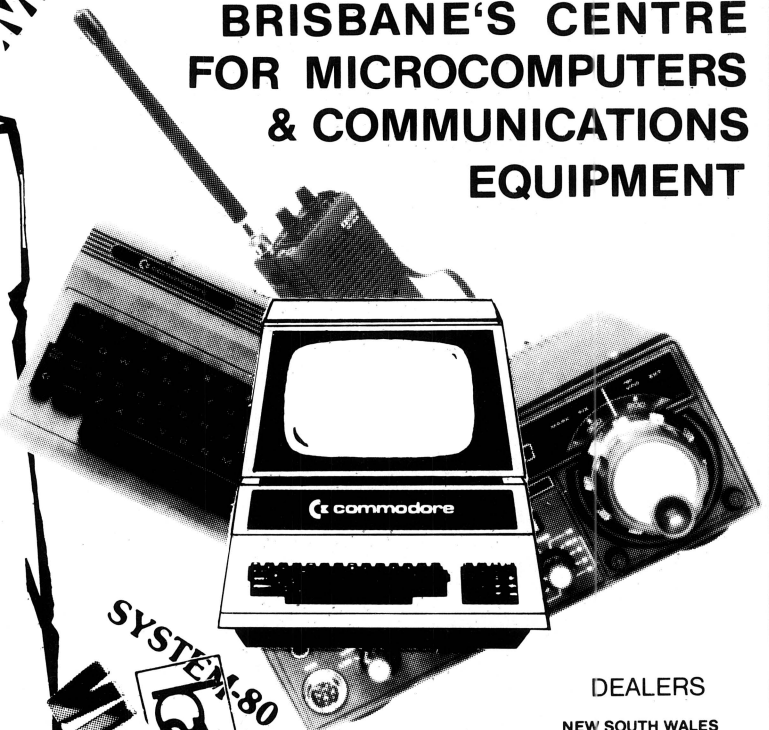
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connecting it all together. The instructions made sense, even to me, so I soon had it all wired up.

Switch on, ignition, and...Nothing.

Not a sausage.

B----r all.

I checked everything; twice. It all looked right to me; Then I had my girlfriend check it and she didn't understand it at all. But she did agree with me (no fool, that girl).

I tuned the television to every channel and still no joy. So I rang Les.

Bell, of course, was out pontificating with his mates (boozing, actually), it being Friday night; and here I was doing his work for him!

Finally, at lunch time on Saturday, I rowed him from his hangover.

"No, no", he said, "that TV set isn't a TV set — it's a video monitor. You don't need the RF modulator (whatever that is...); it shouldn't be wired in at all. Just plug the computer directly into the monitor".

"Why dincha bloody tell me???"

"Please — not so loud!"

Suffer, ya twerp. You deserve your hangover.

This time, of course, it worked. I was on the very edge of success. The screen lit up and the computer printed out its first message. I'd already devoured the manual, with a couple of bottles of beer — there being nothing much else to do the

previous evening — so I hoed in and tried the first example (attentive readers might ask at this point what happened to his girlfriend. Obviously he is a fully qualified office idiot . . .).

It worked. It printed 'VIC20' again and again in a bar down the screen. All right, try a couple more. They all worked, just like it said in the book.

Time to balance the chequebook. Umm, er, ah, where do you start? I went back and read the manual.

Silly thing never mentioned chequebooks anywhere. It gave a lot of crude stuff about PEEK and POKE and GOTO, but surely all that's a bit primitive. So I rang Les again and asked him.

"You have to learn to walk before you can run", he said, not realising I'd already passed RUN and was now looking for BALANCE.

"Sure, BASIC instructions by themselves are primitive, but every program is made up of lots of primitive instructions, no matter how sophisticated it is".

And they'd worked.

That was so helpful I went back to the manual. I started typing in the examples, and by late that afternoon I'd tried them all.

In the manual there was a recipe file program — finally this machine and I were starting to see eye to eye.

I tried a few programs from the

magazine too, and one of them worked first time; another one ran, but took a bit of fiddling, while the third must have been bad to begin with, because it never looked like working. You'd think these smart-Arfur editors would check, wouldn't you? (*The Idiot was having a little trouble distinguishing assembly language from BASIC — Ed*).

I got the feeling that programming computers can be very frustrating when the computer won't do what you want and you can't work out why. Les tells me that feeling passes with experience — trouble is, you have to persevere to get the experience...

We spent an hour on Sunday night playing with the games cartridges (*Okay, Moron, who is we? You and the lady; you and Bell; Who?*).

The Super slot game was impressive to look at but no big thrill — you can have more fun at the club if you like that kind of thing. Road Race was better, though neither of us could manage more than a minute without crashing (Oh, it was Bell).

My weekend with the VIC was valuable, anyway — I'm now sure I'll buy a personal computer eventually.

But I'm hanging out for one with a really good chequebook balancing program, and some other sensible stuff.

I'm no fool...



**This Easter
Remember...**

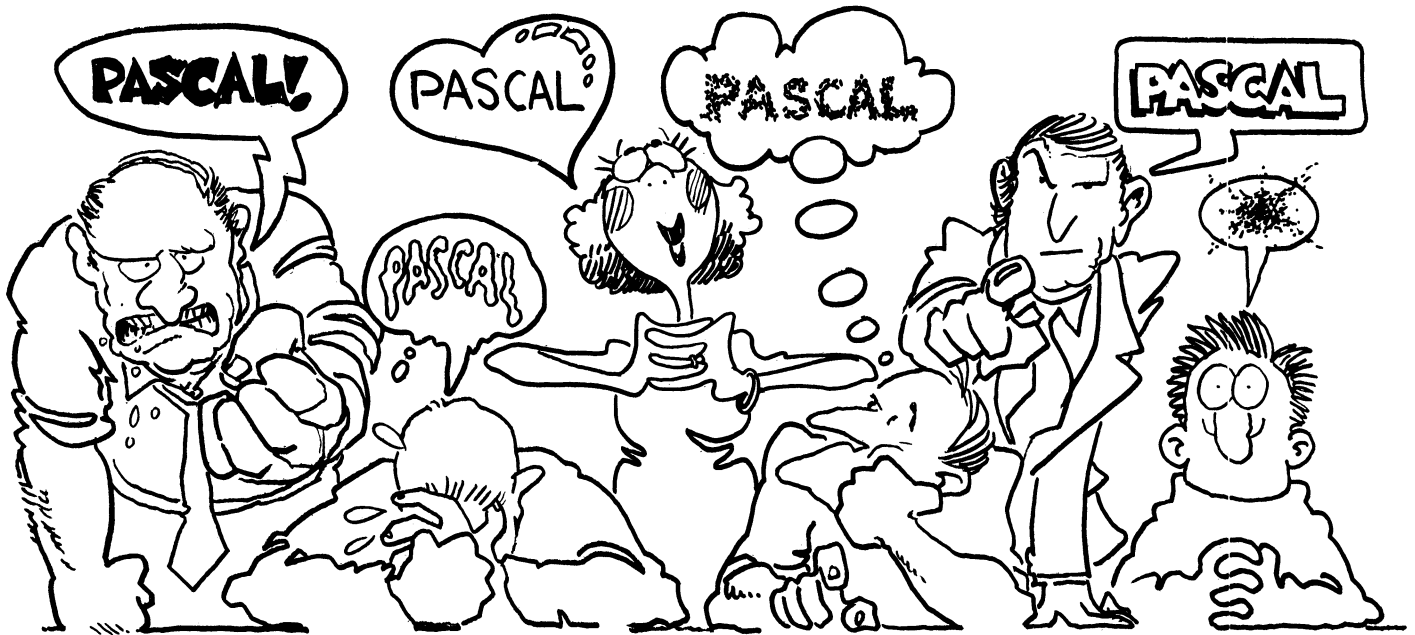
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Pascal

For Better or Wirth!



What is it about the programming language Pascal that arouses such intensity of feelings? Its proponents tout its power and generality, structured program design and ease of use. The opposition sneer and proclaim 'Jack of all trades, master of none'. LES BELL volunteered to stand on the fence and look at the language...

PASCAL IS one of the most modern and best known of a line of languages which started with Algol in the late Fifties. Rumours abound as to how Pascal started, and to the motivation behind its designer, Niklaus Wirth.

Algol was a simple but stylish language. However, every programmer feels his language should have more 'bells and whistles' so Algol became subject to periodic review. By the mid-Sixties a committee was working on the design of a new version which became Algol 68. This language had just about all the bells and whistles any programmer could want.

Herein lies the central crisis facing language designers. If a language is too small, it simply won't do the job satisfactorily. If it is too big, a programmer can't remember all the functions and statements it provides, so he'll gradually settle into using a subset which meets his needs and forget about the extras. Also, many of the additional features may be tacked on in such a way that they give rise to special cases and extra rules which make the language impossibly complex.

In the debate between proponents of large and small languages, Wirth came down on the side of 'small is beautiful'. The researches of Dykstra and others had shown that only three types of control statements were required to write any program.

Wirth felt other advantages would accrue from a language which was small and simple, yet allowed the programmer to extend it with his own data types and functions.

Such a language could be mastered quickly, and would be ideal for teaching structured programming. With its simplicity and strong data typing, the compiler could catch many errors before a program was run.

Convinced of the advantages of this approach, and not impressed by the gigantic Algol 68, Wirth drafted a preliminary version of his language in 1968. The first compiler was developed in 1970, and in 1973 a revised standard was published.

Pascal grew steadily in popularity, especially as a teaching language. One interesting aspect of its implementation was the use of an interpreter to execute code generated by the compiler for a hypothetical pseudo-machine. To transport the compiler to a new machine, only the interpreter had to be rewritten, since the compiler itself consisted of pseudo-code.

Ideal For Micros

This approach attracted the attention of Dr Ken Bowles at the University of California (San Diego), who felt that Pascal would be an ideal language for small mini and microcomputers. The use of the p-code interpreter would make it easy to transport between machines, so if the entire system (editor, assembler, linker, filer and not just the compiler) was written in Pascal, an entire operating system could be easily brought up on new machines.

Running first on a PDP-11 and then an 8080, the UCSD Pascal system grew from a small academic project into a major commercial undertaking. It now runs on all kinds of microcomputer, from Apples and CP/M systems (though not using CP/M) to LSI-11 based graphics systems.

It would be fair to say the UCSD Pascal system, and in

particular the Apple implementation, are largely responsible for the popularity of Pascal with microcomputer programmers today.

Now, About This Language

So what is Pascal?

To a BASIC programmer, Pascal looks rather strange. There are no line numbers, and in many programs there are no **goto** statements. The text snakes from the left edge of the paper across to the middle and back again, and there are mysterious colons before the equals signs. What does it all mean?

First, identifiers (names of variables, constants, types, procedures and functions) can be any length, though the compiler can only be counted on to recognise the first eight letters.

This provides an excellent opportunity for the programmer to use meaningful names. Examples might be:

*HourlyRate; HoursWorked; Angle4; pi; or even
HereisALongVariableName*

Numbers are expressed in the same way as in BASIC, including exponential notation (the mysterious E in the middle of numbers).

Strings are enclosed in single quotes like so:

'a'; 'The answer is '; 'Hello'.

Pascal allows several different standard data types, as well as allowing the programmer to define his own.

Type **integer** is like an integer in BASIC; on microcomputers this is generally restricted to the range -32768 to 32767.

Integer operators include **+**, **-**, *****, **div** (integer division) and **mod** (remainder). Functions returning integer values include **trunc(x)**, which discards the fractional part of x, and **round(x)**, which rounds the value of x. There is also an implementation-dependent standard identifier **maxint**. It returns the value of the maximum integer which can be represented.

Type **real** is the same as ordinary numbers in BASIC. As long as one of the operands is real, the following operators and functions return a real value: **+**, **-**, *****, **/**, **abs(x)**, **sqr(x)**, **sin(x)**, **cos(x)**, **arctan(x)**, **ln(x)**, **exp(x)** and **sqrt(x)**.

Type **char** is the set of characters supported by the computer system. It will at least include the set of capital letters, the digits and the blank space character. Two functions **ord(c)** and **chr(i)** are the equivalents of BASIC's **ASC(c)** and **CHR\$(i)** respectively. Previous and succeeding characters are given by **pred(c)** and **succ(c)**.

The **boolean** data type can take on only two values: true and false. Pascal provides **and**, **or** and **not** logical operators. Several Pascal functions return Boolean values, such as **odd(x)** (true if x is odd), **eoln(f)** (end of line) and **eof(f)** (end of file).

These are the basic data types in standard Pascal. Others can be defined in the **type** section of a program like these:

type

```
Colour = (black, brown, red, orange, yellow, green, blue,  
          violet, grey, white);  
MonthOfYear = (Jan, Feb, Mar, Apr, May, Jun, Jul, Aug, Sep,  
              Oct, Nov, Dec);
```

Later, the **var** section of this program may go on to declare some variables in the following way:

var

```
Semester, start : MonthOfYear;  
Square, band : Colour;  
YearDay : int;  
DistanceTravelled, Value : real;  
GotThere : Boolean
```

Program Structure Explained

A Pascal program is broken up into several distinct sections, which must appear in the correct order. First is the *program heading*:

program NothingInParticular (input,output);

The (input,output) part is really a list of the files used by the program. In this simple case, the program uses the predefined files input and output, which are the keyboard and screen.

Next comes the label declaration part. Any statement in a Pascal program may be prefixed by a label, making it a potential target for a **goto** statement. But gotos are frowned upon by dedicated Pascal purists and should only be used when there is absolutely no alternative — that is, never. They can sometimes be handy for fatal error handling, though, so if you do use a label it should be declared to the compiler here:

label 23, 45;

Then comes the constant definition part. In BASIC, beginners are apt to use values like 3.14159 throughout their programs. Now should Australia ever join the European Common Market, and the value of pi be changed as a result to 3.00000, such programmers will have to go right through the program changing 3.14159 to 3.00000. They might possibly miss one.

Worse still, somewhere in the program a value of 3.14159 might not represent pi, but instead represent the litres/kilometre consumption of the programmer's transport. If that value is changed, then it's wrong. Good programmers *hate* constants.

const

```
pi = 3.00000; (* subject to ratification *)  
LitresPerKm = 3.14159;  
ScreenWidth = 80;
```

One of the lines above also illustrates a Pascal comment. Comments can appear almost anywhere, and start with **('** and close with **')**, or alternatively, with **{** and **}**.

Next comes the *type definition* part. This follows the example above and is followed by the variable declaration part; again, like the example above.

Introducing Some Code

After all this we can now introduce some code, in the form of the procedure and function declarations. Every procedure or function must be defined before it is used. This is done here, before the program proper which will use these definitions. Here are a few examples:

function area(radius : real) : real;

begin

```
    area := pi * radius * radius;  
end (* area *)
```

procedure cls;

begin

```
    write(chr(12));  
end (* cls *)
```

function factorial(n:integer): integer;

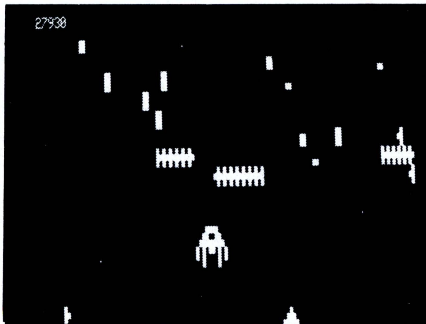
begin

```
    if n < 0 then begin  
        write('error — negative factorial!');  
        factorial := 0;  
    end  
    else if n = 0 then  
        factorial := 1  
    else  
        factorial := n*factorial(n-1)  
end (* factorial *)
```

ARCADE FAVOURITES

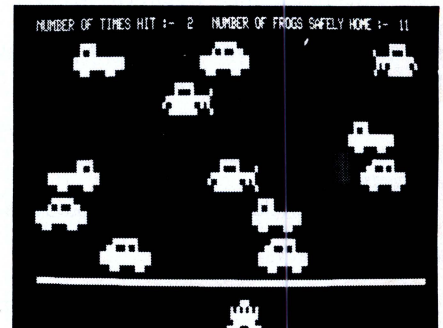
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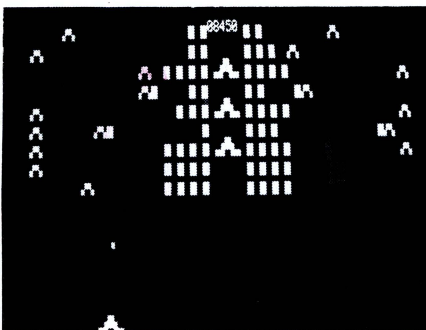
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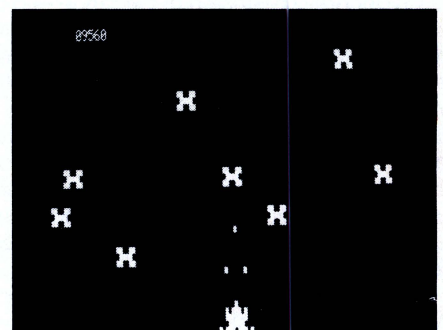
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Several points arise from these examples.

First is the use of the colon before the equals sign in assignment statements. Pascal uses the `:=` symbol to represent assignment, and reserves the `=` symbol as a test for equality or for use in constant definitions.

Next is the difference between functions and procedures. In the function area above, you will notice there is a variable called *area* which is set equal to $\pi * r * r$. This is the value returned by the function, so the function can be called by a line like:

```
circle := area (radius);
```

On the other hand, a procedure does not return a value. That's why function *area* is specified to be of type *real*, with a real argument, while procedure *cls* is untyped. The fact that it does not take an argument is incidental.

Lines of code are grouped together by the **begin** and **end** keywords to form block structures. This block structure makes code easy to follow, after a little practice.

Note, however, there is only one exit point from the function factorial, although two different cases are considered — something that is not easily done in BASIC.

How Functions Call Themselves

Function factorial also illustrates another interesting point about Pascal — its ability to support recursive code. This means a function can call itself. In this case, to calculate *n*, the function calculates (n-1), then multiplies it by *n*. Now (n-1) is calculated by working out (n-2) and multiplying this result by n-1, and so on.

Once you've grasped the concept of recursion (or self-reference) it's simplicity itself. If you haven't, then think about it; it's a slippery idea to grasp, but well worth the trouble.

After declaring the functions and procedures, you can (at last!) write the program itself, delineated by **begin** and **end** keywords.

The program is written in exactly the same way as a function or procedure. The final **end** is followed by a full stop, which indicates the end of the program and relief for the by now over-worked compiler.

As just mentioned, Pascal is compiled. This means the program is written using pencil and paper (what — you don't write all your programs on paper first?), then entered into a text file using the system editor. Under the UCSD system this is the standard

system editor; under CP/M, OS/9 or other operating systems it is whatever you have.

Next, the program is compiled. The output from the compiler is either p-code for a hypothetical pseudo-machine (a la UCSD) or is assembly language/native code for the target processor (a la Pascal/MT+ or Pascal/Z).

If it is p-code it must be interpreted using either the permanently resident interpreter of the UCSD system, or PRUN.COM in the case of Pascal/M for CP/M.

Okay, A Real Case

As an example, Figure 1 shows a short Pascal program.

I wrote it for a specific purpose: to sort the list of 8080 opcodes which appeared in the assembly language tutorial series. It is written in Pascal/M, which conforms closely to ISO (International Standards Organisation) Pascal and is for the most part compatible with UCSD Pascal. It should run on just about any computer.

Figure 1

```
program SortOps (OpsInFile, OpsOutFile);
const
  N=260;

var
  OpsInFile, OpsOutFile: Text;
  opcode: array[1..N] of string;
  pass, index, count: integer;
  Temp: string;

begin
  Reset (OpsInFile, 'B:OPCODES.DAT');
  Close (OpsInFile);
  Rename (OpsInFile, 'B:OPCODES.BAK');
  Reset (OpsInFile, 'B:OPCODES.BAK');
  index := 1;
  count := 0;
  while not eof (OpsInFile) do
  begin
    readln (OpsInFile, opcode[index]);
    index := index + 1;
    count := count + 1;
  end;

  for pass := 1 to count-1 do
  begin for index := 1 to count-pass do
    begin if opcode[index] > opcode[index+1] then
      begin Temp := opcode[index];
        opcode[index] := opcode[index+1];
        opcode[index+1] := Temp;
      end;
    end;
  end;

  Rewrite (OpsOutFile, 'B:OPCODES.DAT');
  for index := 1 to count do
    writeln (OpsOutFile, opcode[index]);
  close (OpsOutFile);
end.
```

Although this program does not use any functions, it does show the overall structure of a program fairly well. This is broadly comparable to one of the programs in the BASIC for Birdwatchers series (if I'd remembered that earlier I'd never have written it!). Although the structure is similar, it is a lot clearer in the Pascal version.

Points to note:

- instead of declaring an array of opcodes as `opcode[1..260]`, I declared instead an array `opcode[1..N]` with *N* pre-declared in the constant section as 260 (or whatever). Of course, I then went on to violate my own rule about constants by building the filenames B:OPCODES.DAT and B:OPCODES.BAK into the program. So don't feel too bad about breaking the rules! (Or, do as I say, not as I do!).
- Pascal/M has an extra data type **string** (really a special sort of

array of char) which is used to hold the lines as they are read in. OpsInFile and OpsOutFile are both files of type **text**, another pre-defined type in Pascal/M.

- A few words about the functions used: Reset opens a file, Close closes it. Reset resets the read pointer to the beginning of the file. And eof(file) returns true when attempting to read past the end of a file.
- readln is roughly equivalent to BASIC's INPUT statement; writeln is equivalent to PRINT. Rewrite opens a file for writing, over-writing the old file.

That's it. Compare it to the BASIC original and it will make even better sense.

Pascal's Advantages

Pascal has several advantages over simpler languages such as BASIC.

First, there's its block structure, which more naturally reflects the structure of a top-down-designed programming style. Variables can be declared at the beginning of a block and can only be accessed in that block. This means that inside a block (or function or procedure) new variables can be used which are unknown to other blocks.

Have you ever used I or N twice in a BASIC program, usually as a loop counter, only to find interaction between the two program segments? Pascal doesn't suffer from this problem.

Second, the block structure, combined with the ability to call functions by name, makes program editing and development much easier. I customarily edit programs with WordStar, a process that is much faster than, say, BASIC's built-in line editor. The absence of line numbers makes it easier to insert blocks anywhere.

Next, the ability to create data structures such as records makes keeping track of complex inter-related data a lot easier.

For example, a mailing list record may be defined as:

type

```
person = record
  FirstName : string ;
  LastName : string ;
  Addr1 : string ;
  Addr2 : string ;
  PostCode : 2000..8999 ;
end ;
```

var

```
MailList : file of person ;
```

You'll see that files can contain structured types, so creating a mailing list file is easy. Declaring a record is somewhat similar to using a FIELD statement in BASIC, but much more elegant.

The Pascal compiler is very strict about data typing and declarations. This is difficult for a BASIC programmer to get used to, as BASIC is comparatively forgiving.

On the other hand, the Pascal compiler forces you to go away and design your program correctly right from the start. You should always do this anyway, but BASIC programmers are often lured into writing programs at the terminal. This approach will not work with Pascal.

Second, because the compiler knows so much about your data types, constants and so on it can often spot logical errors in your code, even at compile-time, before the program has been run. In fact with Pascal there's a good chance that if a program compiles correctly, it will run.

All of this adds up to a powerful language.

Pascal has achieved a degree of popularity, particularly in academic circles, that assures it of a long future. ☐

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Sorcim's Pascal/M

For CP/M users who don't want to abandon existing file formats, UCSD Pascal is a bit of a tease. The answer for many is Sorcim's Pascal/M, which is compatible with UCSD but runs under CP/M. Here's LES BELL's evaluation.

SOME TIME back, I decided I ought to have Pascal on my system. Now while I admit I don't use Pascal much, it certainly offers a number of advantages over BASIC, particularly for larger programs.

At *Your Computer* we already run Pascal on an Apple, but we've stumbled across one problem: we have Applesoft files, CP/M files and Pascal files, and they're all incompatible. All my files are created under CP/M and I wanted my Pascal programs to be able to read them, so this ruled out UCSD Pascal, which has its own operating system.

On the other hand, UCSD Pascal has a few nice features which I'd like to have; so what was the answer?

Pascal/M by Sorcim seems to be the answer. Although it runs under CP/M and can read and write CP/M files, it compiles to p-code like UCSD and is run using an interpreter. What's more, for the most part it is source-code compatible with UCSD and in many areas exceeds UCSD's performance.

All the standard features of Jensen and Wirth are implemented, with a couple of exceptions. For example, **pack** and **un-pack** are not provided (as all structures start on byte boundaries), **dispose** is not provided (though **mark** and **release** are).

While standard Pascal was designed as a teaching tool, Pascal/M is intended for use as a production language. For this reason it has a number of extensions over Jensen and Wirth or ISO Pascal.

Most of the extensions in Pascal/M are implemented as pre-defined procedures and functions, so they do not conflict with standard Pascal.

Invoking The Compiler

Pascal/M is supplied on a single-density single-sided IBM format diskette, although other formats are available. The disk contains the compiler itself, the object library and p-code interpreter. Like UCSD Pascal, Pascal/M compiles to p-code and requires a p-code interpreter to run.

Therefore the compiler is invoked with the command

```
A>prun pascal progname
```

which loads and runs the p-code interpreter PRUN.COM. This in turn loads and runs the compiler PASCAL.PCO and passes it the command line parameter PROGRAMNAME. The compiler will read the input file PROGRAMNAME.PAS and produce a p-code file PROGRAMNAME.PCO. This is then run with the command

```
A>prun progname
```

Other files supplied on the disk include DATTIM.COM, which sets the date and time for use by the procedure Time, CONFIG.PCO which configures PRUN.COM for the user's terminal, CONSTRL.ASM which allows configuration when CONFIG won't work and CONTEST.PAS, which tests the terminal functions. There's also a submit file which transports the necessary files onto your system disk and a compiler test program.

Installing the program is simplicity itself; just type

```
A>submit b:installp
```

and the submit file transports the necessary files onto drive A: and tests the compiler.

Pascal/M supports a number of terminal functions such as GotoXY, Conact(0) (clears screen) and others. The codes to do this are in PRUN.COM. They can be changed by running CONFIG.PCO, which asks the user what kind of terminal he has and offers the opportunity to edit the control codes. In most cases this is quite simple.

The functions can be tested by CONTEST.PAS, which provides various tests and then goes on to draw a sin curve and spiral on the screen. As an example of the use of the cursor control functions, a game called CHASE.PAS a version of the ever-popular Blockade is included.

Extensions And Strings

Like UCSD, Pascal/M supports segment procedures. These are procedures that are only loaded into memory when needed, thus allowing overlays to be created and saving memory space. While UCSD allows up to seven segments in a program, Pascal/M programs can have up to 40; this should be enough for even the most ambitious programmer.

Standard Pascal is rather weak on string handling. Pascal/M rectifies this through the pre-defined **type** String. A string is really a one-dimensional packed array of characters. Unlike a standard array, however, a string has a dynamic length attribute, which is in fact the zeroth entry in the array. Pascal/M strings can be

Software Report Card

Program:	Pascal/M			
Made By:	Sorcim			
Useful for:	Learning Pascal, commercial applications			
Hardware Req'd:	8080/Z-80, CP/M, 56K RAM			
Ratings:	excellent	very good	good	poor
Documentation		✓	✓	
Ease of Use	✓			
Speed			✓	
Functionality		✓		
Support			✓	
Value-for-money		✓		

manipulated in much the same way as BASIC strings.

Intrinsics are provided to concatenate two strings, delete or copy characters from a string, insert characters into a string, find the length of a string, find substrings, and convert an integer into a decimal or hex string.

As experienced Pascal programmers will know, Pascal functions can only return scalars, thus functions of **type** string are theoretically impossible. However, the Pascal/M string intrinsic functions are 'magically' known to the compiler.

In addition, a set of intrinsics perform the most common byte oriented operations on packed arrays, such as filling an array with a character, shifting the array left or right, searching for a character, and so on.

Pascal/M supports untyped files; that is, object image binary files which can be read to or written from any area of memory. They're nasty and non-portable, but the kind of facility its difficult to do without when you need it.

Another useful extension is the long integer type which gives the programmer access to a 32-bit integer. Thus the pre-declared constant `MaxLInt` (maximum long integer) is 2147483647. Pascal/M provides a ghost character, the underscore, which can be inserted into integer constants to make them more readable.

Inlegant, But It Works

Pascal/M's method of linking to a machine-code procedure is not particularly elegant, but it works. An external procedure is declared in a similar way to a forward reference declaration. The body of the procedure consists of the keyword **external**, followed by an integer constant which must correspond to one of the jump vectors in the table at the beginning of the block of machine-code procedures.

The machine code procedures must reside in an object file with a header giving the number of procedures, their load address and a jump table, followed by the procedures/functions themselves. Parameters are passed on the stack; parameters passed by references are represented as addresses rather than values.

When the program is run, the command line must contain an extra parameter and the name of the external procedures file:

```
A> prun myprog @m=myprocs
```

This will load the file `myprocs.ext` for use by the Pascal program `myprog`. The scheme does work, but it is not particularly elegant. I believe a new version of Pascal/M is under development and will support searchable libraries and a linker, so we can hope a more elegant means of linking in machine code will be implemented then.

Pascal/M's write procedure supports both left and right justification, where standard Pascal supports only right.

File handling under Pascal/M is basically the same as with Jensen and Wirth, but several extensions make life rather easier, particularly where random files are concerned. Procedures are provided to close, rename and purge files, as well as the standard Pascal I/O procedures `get` and `put`, plus `read`, `readln`, `write` and `writeln`.

For random access of typed files, Pascal/M has several additional features: the function

```
function Size(var F: file of [any type] ): Integer;
```

will return the number of elements in that file. The file-pointer can be examined using the function

```
function Next(var F: file of [any type] ): Integer;
```

which returns the cardinal number of the next record to be accessed via `get` or `put`. Finally, the procedure

```
procedure Set Next(var F: file of [any type]; POS: integer);
```

allows the user to set the file-pointer anywhere in a file in preparation for the next `get/put`.

These functions allow the use of random access files under Pascal/M; neither Jensen and Wirth nor the ISO standard mentions random I/O.

Drawbacks And Advantages

Pascal/M seems to have few major failings. The biggest disappointment is perhaps its slow speed, particularly on disk I/O. For example, a simple disk file sort ran at approximately one-tenth the speed of an equivalent BASIC program, with the major delay being in reading the input text file.

The next drawback is the absence of a separate linker. This would have been particularly useful when dealing with machine code procedures. The present method of linking to machine code is not much of an advance over direct `CALLs` in BASIC.

Now the good news. Pascal/M is a very complete compiler indeed and is easy to use. It conforms closely to the J and W standard — in fact the manual is arranged as a continuation of the book, to the extent of continuing the chapter numbering and appendices. For this reason, Pascal/M should find a home in the educational market.

The use of standard console procedures (`Conacts`) means Pascal/M programs can be transported from machine to machine without being re-compiled or

patched. The console commands are embedded in the run-time interpreter and need only be set up once.

The system is very supportive, particularly when it comes to run-time errors. For example, unless range error checking is specifically disabled, if a variable goes outside its limits, the program will stop and the user will be given the opportunity to modify the variable or quit. This kind of assistance can make debugging with Pascal a real pleasure in comparison with simpler languages.

One of the major advantages of Pascal/M is its run-time debugger, `PASDDT`. This allows the user to single-step through a program, change variables, trace procedure calls or stop the program. It is a symbolic debugger, meaning procedures and variables can be referred to by name.

Using The Debugger

To use the debugger, the program must be compiled using the D option. This generates extra p-codes to allow `PASDDT` to locate statements and set breakpoints. The compiler can also generate a symbol table file which is used by `PASDDT`.

The debugger allows the user to examine and change variables of any type, set and clear breakpoints, display the nesting of procedures/functions, and so on. In the case of structured variables such as arrays, either the entire array or a single element can be accessed; but in the case of records, individual fields are not accessible.

Pascal/M is adapted particularly well to the CP/M environment. For example, device names such as `A:`, `B:`, `CON:`, `CRT:`, `PRINTER:`, and `LP:` are predefined, and may be used as names of interactive files (a read from a file of type `interactive` does not assume the buffer variable always contains a character). This means I/O redirection is quite easy.

The documentation supplied with the Pascal/M disk is adequate, and cleverly designed to match the *Pascal User Manual and Report*, to which it forms an extension. Of course, you should not expect to be able to learn Pascal from the compiler manual, so the Pascal/M manual is primarily a reference document, though it is fairly readable (after spending all that money on a piece of software, you'll read anything!).

A number of utility packages have started to appear, containing procedures and functions for use in Pascal/M programs. These include screen handlers, sort packages and others, and would seem to suggest Pascal/M is finding commercial acceptance.

Overall, then, Pascal/M rates as a good, all-round, though slow, Pascal compiler. It offers UCSD-style functions to the CP/M user, and will probably find its market in the educational and business areas. Good value. □

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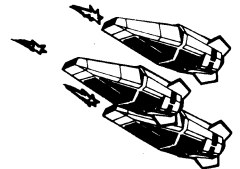
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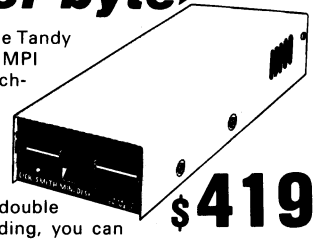
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UCSD, According to Apple

Two pieces of software really stand out as helping to establish the Apple II as a 'serious' machine — VisiCalc and Apple Pascal. Here's a rundown of Apple's implementation of UCSD Pascal.

WHEN Apple first obtained its licence to distribute Ken Bowles' Pascal compiler, operating system and utilities, it could hardly have realised what it had.

Apple's two BASIC interpreters, Integer BASIC and Applesoft, were adequate but not exciting (otherwise how would Microsoft sell so many Softcards?); Assembler was available but a drag. A good systems language was needed.

UCSD Pascal turned out to fit the bill exactly.

To recap on the principles behind UCSD Pascal, it uses a permanently resident p-code interpreter to run the system utilities, which are all written in Pascal. Moving UCSD Pascal between different processors is mainly a job of re-writing the p-code interpreter. This has been successfully done so many times for so many different machines that UCSD Pascal has achieved something of Kilroy's notoriety.

Incidentally, this means many of the comments made here also apply to implementations of UCSD Pascal for other machines, such as 8080/Z-80, LSI-11, TMS9900 and 6809-based systems.

Apple was in on the act quite early. Apple took UCSD Pascal and extended it (UCSD Pascal was designed to be easily extended) so it supports the Apple's various peripherals and colour graphics. The result is a system that extends the Apple's capabilities significantly, making it ideal for the computer science student, formal or informal.

Language Differences

Apple Pascal is slightly different from Standard Pascal; most of the differences are extensions. UCSD Pascal does not support Standard Pascal's DISPOSE function; instead, two new built-in functions called MARK and RELEASE are provided for management of heap storage.

Several new variable types are supported. Chief among these is STRING, which has been adopted by most other microcomputer Pascals, notably Pascal/M. Another UCSD innovation

which migrated to Pascal/M is the new file type, INTERACTIVE, which improves the operation of the console and printer files. A set of procedures has been provided for each of these types.

As microcomputers have only 8-bit words, and can directly address any word, there is no need for Standard Pascal's PACK and UNPACK. They are the same thing as far as a microcomputer is concerned. There is also a set of byte manipulation procedures, such as SCAN, MOVERIGHT (-LEFT) and FILLCHAR.

To support business arithmetic, UCSD (Apple) Pascal has a LONG INTEGER type, which can contain up to 36 BCD digits.

Modular compilation is supported through units, external procedures and segment procedures. Units are separately compiled collections of procedures which can be integrated into any main program using the linker. External procedures are created using the UCSD Assembler, then linked in, while segment procedures live on disk and are only loaded into memory when they are active.

Apple extended the UCSD system most obviously through the provision of a library

of graphics functions for the Apple screen. Known as Turtlegraphics, these procedures are loosely based on the turtle of the actor language Logo. In addition, unit APPLESTUFF contains a RANDOM function, PADDLE, BUTTON and TTLOUT, and a music-making procedure, NOTE.

Finally, the transcendental functions have been removed from the main library and put into their own unit.

UCSD Pascal includes a number of interesting extensions to the standard language. I/O and file-handling procedures are similar to those in Pascal/M discussed elsewhere. Device I/O can be performed at a low level with the UNITREAD and UNITWRITE procedures, with added facilities in the UNITBUSY function and UNITWAIT and UNITCLEAR procedures.

Untyped files can be read and written using the BLOCKREAD and BLOCKWRITE functions. Other miscellaneous functions include HALT, EXIT, MEMAVAIL, GOTOXY (cursor positioning), and TREESearch (searches a binary tree).

The compiler has a number of options including allow/forbid the evil GOTO,

Software Report Card

Program:	Apple Pascal (UCSD Pascal)
Made By:	Apple Computer
Useful for:	Learning Pascal, any sophisticated task
Hardware Req'd:	Apple II With 48K RAM, one disk drive

Ratings:	excellent	very good	good	poor
Documentation	✓	✓		
Ease of Use		✓		
Speed		✓		
Functionality		✓		
Support		✓		
Value-for-money			✓	
Extras included:	Turtle graphics, etc.			
Price:	\$295 (language only)			
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enable/disable I/O checking, include files, list to file or printer, only load UNITS when active (similar to segment procedures), enable/disable range checking, force units or segments to be resident within other procedures, enable segment swapping in the compiler itself (slows compilation), generate 'system programs' and use different libraries.

With all these options, it is obvious that the compiler is quite powerful indeed. A particularly potent feature of the UCSD system is that, since it includes its own operating system, it is able to perform swapping of segments in and out of memory.

While this is not a true virtual memory system, it does allow the experienced programmer to create programs which are much larger than the available memory. In fact the UCSD system makes extensive use of this feature itself.

Operating System And Utilities

As mentioned above, UCSD (Apple) Pascal is much more than just a language and compiler. Instead, it is a complete operating system with file manager, screen-oriented editor, assembler, linker, formatter, librarian and desk calculator.

The complete system is supplied on four diskettes. This is the major drawback of the system: it is a large system, and Apple's diskettes are comparatively small. Although the system can be run on one disk drive, the user will be perpetually swapping diskettes. Two diskettes are much better; four (as we've used on occasion) are another improvement. A hard disk is the ideal answer.

Due to the size of the system, and the requirement to have the p-code interpreter in memory at all times, the system also includes a 'Language Card'. This is really just a memory card into which the p-code interpreter is loaded and then write-protected. This card overlays the Apple's BASIC ROMs, giving more RAM space.

On a cold boot, the interpreter (SYSTEM.APPLE) is loaded into the language card, followed by SYSTEM.PASCAL (operating system command level) and SYSTEM.MISCINFO (terminal configuration info). At this stage the system will sign on and you are ready to start work.

The system is menu-driven. At the top of the screen is the command prompt line:

```
COMMAND: E(DIT, R(UN, F(ILE,
C(OMP, L(INK, X(ECUTE, A(SSEM,
D(EBUG, ?
```

With Apple's 40 column screen, Pascal text (which can become heavily indented) will 'roll off' the right hand edge of the screen. To get around that, the Apple screen is split into two 'pages', each 40 characters wide; a control-A command

will switch back and forth between the left and right pages.

Of course, a full 80-column terminal or video card can be attached to the Apple to act as console device.

Many of the menus won't fit even on an 80-column line — extra commands are accessed with a question-mark. For example, with the main menu typing '?' to see the rest of the line will display:

```
COMMAND: U(SER RESTART,
I(NITIALIZE, H(ALT
```

Typing any of these letters will cause the appropriate diskfiles to be loaded and executed.

The system generally works with a default set of work files (SYSTEM.WRK.TEXT and SYSTEM.WRK.CODE), so editing, compiling, saving and updating can all be achieved without specifying the name of the file. Of course, the current workfile can be saved under any name, and any other file made the next workfile.

Brickbats And Bouquets

The filer contains commands to handle most of the tasks of moving files between disks, saving files, informing the user which files are on which disks, and transferring files to peripherals such as the printer. It is analogous to CP/M's STAT and PIP. Files are dated (bliss!), but size of a file is not dynamically alterable (boo!). The editor is a full-featured screen editor with some special features to aid in editing Pascal programs. Cursor movement is by the left and right arrow keys — Control-O for up and Control-L for down — and repeat factors can precede commands allowing fast movement. Named markers can be set in the file and returned to, and the screen can be scrolled a 'page' at a time. Text can be inserted and deleted anywhere.

A sophisticated global find-and-replace command is implemented, as is block delete and copy. An adjust mode allows movement of entire lines to set correct indentation — particularly important in a structured language like Pascal — while auto indent allows easy entry of indented text. The system editor is as powerful as those found in many word processors.

The Apple Pascal system also includes a 6502 assembler. Based on The Last Assembler, developed at the University of Waterloo, Ontario, Canada, it is a full macro assembler producing absolute or relocatable code which is linked with a Pascal host program. It offers conditional assembly, host-communication directives (.CONST, for globally declared constants; .PUBLIC, for global data; and .PRIVATE, to store private variables in the host's data area), external reference directives for linking assembler routines, and the inc-

lude directive. All in all, a powerful assembler.

The linker is used to combine the various modules of code together into executable programs. Keep in mind that Pascal programs compile to p-code, while the assembly language compiles to true 6502 code, making linking nothing if not interesting. Operation of the linker is fully prompted, as are most of the system utilities.

Other utilities include a disk formatter, system librarian (which allows combination of separately compiled or assembled procedures into a library file) and various utilities allowing reconfiguration of the system for new terminal and peripherals.

The Sophisticated Set

Overall, the UCSD system is one of the more sophisticated operating systems available for microcomputers.

It is powerful enough to support sophisticated programming techniques and large program systems: for example, Six-S Business Advisory's accounting packages, which take advantage of many of the UCSD system's advanced features. It is also well supported by independent software vendors, who sell screen-handling, sorting and other utility packages.

The special units supplied for the Apple make particularly good use of the machine's colour graphics facilities, and turn it into an excellent vehicle for learning Pascal without the traditional mathematical orientation.

The Turtlegraphics module includes commands which allow complete control over the Apple's hi-res graphics through commanding a pen-carrying turtle to move over the screen area, drawing lines as it goes. More sophisticated commands allow the creation of more complex graphics, including user-defined character sets.

Other functions in the module Applestuff allow the use of the Apple's games port and speaker.

The Apple documentation is excellent. Several kilograms of manuals are included with the system, including Jensen and Wirth and specific Apple manuals.

Considering the complexity of the subject the manuals are well written, and take a tutorial approach. The Language Reference Manual, in particular, has an appendix of sample programs which clarify and illuminate many of the key points of the system.

Although the Apple Pascal system is not cheap, it is one of the best value packages available for the Apple. For those contemplating creating any major software for the Apple, it is well worthy of your consideration.

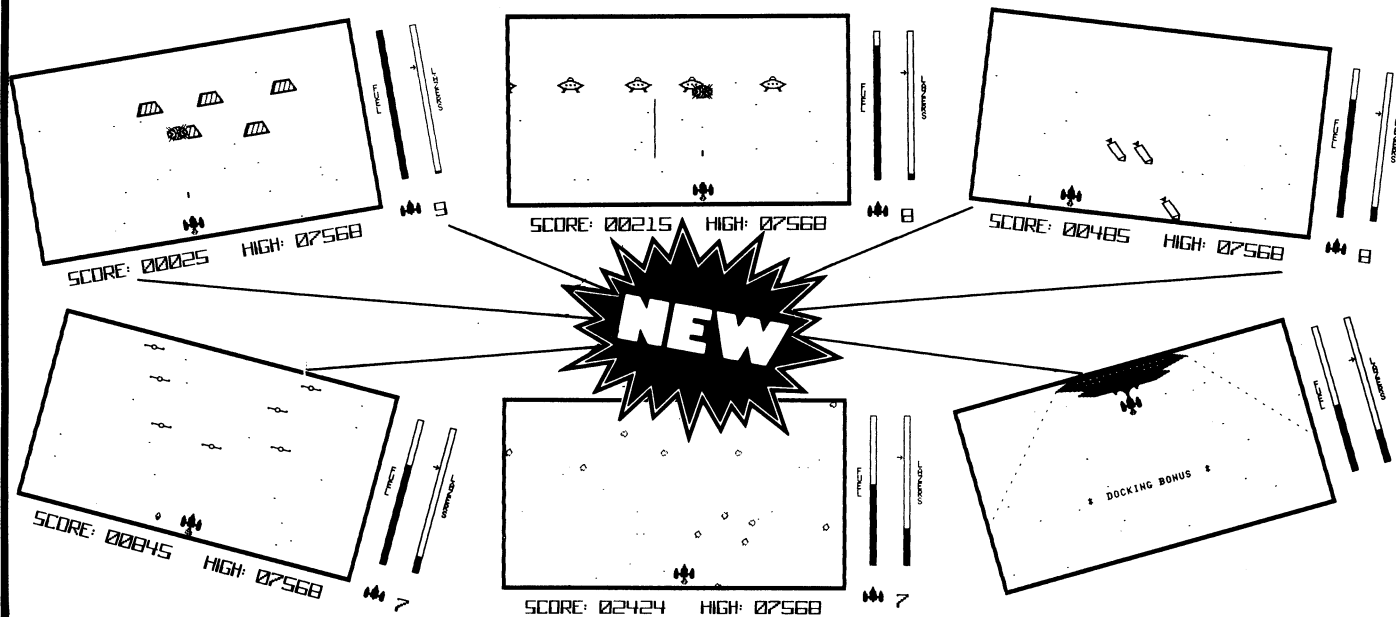
Incidentally, Apple itself did just that when creating Apple PLOT, which is written in Pascal. □

SORCERER SOFTWARE

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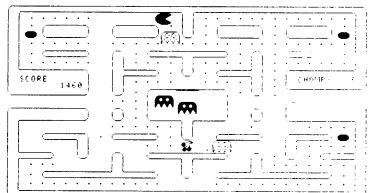
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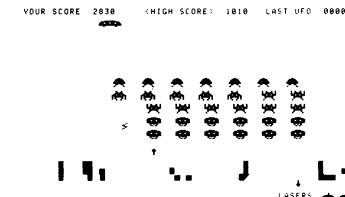
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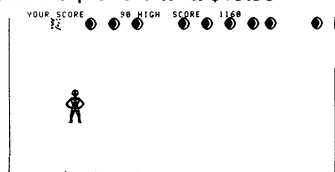
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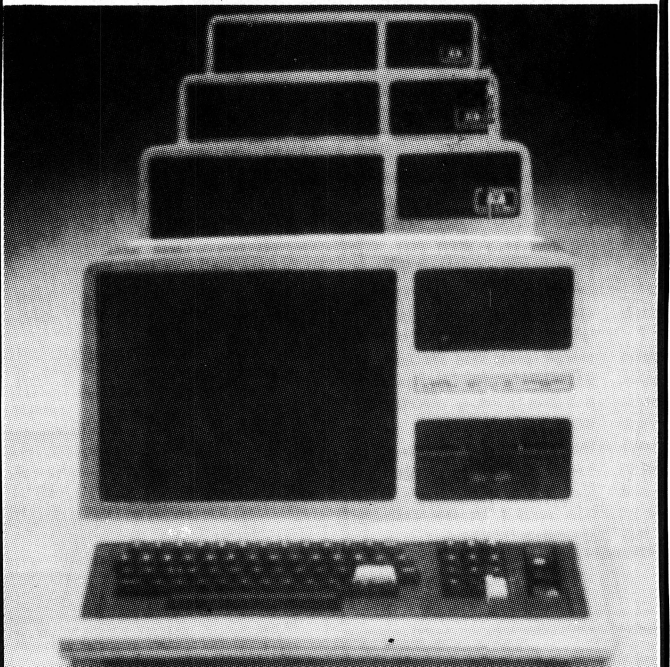
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Tiny Pascal

Do you have a TRS-80/system 80, but find you're fed up with BASIC? Here's an easy way to upgrade to a structured language...with Tiny Pascal.

LOOKING AT the specs of some of the Pascal compilers reviewed in this issue, TRS-80/system 80 owners could be forgiven for thinking Pascal is out of their reach. For example, they all require a minimum of 56K of memory, while the TRS-80 can only be expanded to 48K of RAM.

However, there is an inexpensive way for '80 owners to discover the delights of Pascal. A few years back, Kin-Man Chung and Herbert Yuen wrote a series of articles for Byte magazine describing a p-code interpreter together with a compiler they had written, first in North Star BASIC, and then in a subset of Pascal.

This 'Tiny' Pascal caught on rapidly; it was virtually free, came with full, documented source code and provided an excellent opportunity for the hacker to play around with Pascal. Subsequently, Tiny Pascal has been adopted by a few software publishers and expended into a full-scale product.

Supersoft's Tiny Pascal is a grown-up version of that early effort. It is supplied on cassette for 16K Level II machines, with a 'big' version of the system on side 2 of the cassette.

The system comprises three major parts: the p-code interpreter, editor and compiler. All three are resident in memory at the same time, and are automatically loaded. Also loaded from the system cassette is a sample program which may be edited and examined immediately (or ignored).

With only 16K to play with, you might suppose that the system is rather limited; not so. True, having the compiler and editor in memory at the same time does limit the amount of space available for source and p-code to about 4.5 K, but both the editor and source code may optionally be over-written by compiled code. Thus quite large programs may be generated. In addition, the running program can over-write the compiler, so that more data can be squeezed in.

Tiny Pascal does have some restrictions compared with the larger 'Extended' Pascals. For example, there is no string type. On the other hand, that does not mean Tiny Pascal cannot handle strings. On the contrary, the compiler is itself written in Tiny Pascal, and remember that a

compiler is a gigantic text (string) processor!

Expressions may be either arithmetic or logical, and variable types are restricted to integers and one-dimensional arrays. Strings may be regarded as arrays of integers, if you think about it. Constants may be decimal or hex, and string constants are allowed. An interesting device is the pre-declared array MEM which can be used to read and write memory locations. For example:

```
A := MEM(55B0) + 3; (* read from memory location 55B0 hex *)
T := 27303;
MEM(T) := 0; (* write 0 to memory loc. 27303 *)
```

A second array, MEMW, allows 16-bit words to be read and written in memory.

READ and WRITE work somewhat differently from Standard Pascal, but get the job done. For example, to write on a new line, it is necessary to explicitly write the ASCII code for CR/LF to the output device. On an '80, this can be done by CR alone, as the machine's firmware supplies the LF automatically.

For example:

```
WRITE('THIS IS A PRINT SAMPLE',13)
```

The conditional statements IF, WHILE and REPEAT all test the appropriate expressions for least significant bit = 1 (that is, expression is odd) rather than expression non-zero. This could be a trap for the unwary translator of big-system Pascal programs.

Built-in functions and procedures include ABS, CALL machine code procedure, INKEY, INP, MOVE, OUTP, PLOT (graphics), POINT and SQR. A large number of error codes are used by the compiler, and are documented in the manual.

The sytem includes facilities for reading and writing both source and p-code files to tape.

Several sample programs are included in the manual, including a version of the popular arcade game 'Blockade', while the second side of the cassette includes the complete Pascal source code of the compiler, so that it can be modified by the user (although only in a 32K or larger system).

The manual is brief, but all the major points are covered, including useful subroutine entry points in the monitor, memory usage, and instructions on operation of the compiler. For a full understanding of the system, reference to either the original Chung-Yuen articles in Byte or the Byte Book of Pascal would be helpful. In addition, the user should obtain at least one textbook on the Pascal language.

Tiny Pascal offers about a 4 times speed improvement over BASIC. If you're looking for an entree to structured programming in a block structured language like Pascal, Supersoft Tiny Pascal offers exceptional value.

Our review sample was supplied by Dick Smith Electronics, and is available from Dick Smith Stores. □

Software Report Card

Program:	Tiny Pascal			
Made By:	Supersoft, Inc			
Useful for:	Learning structured programming, fast games, utilities			
Hardware Req'd:	TRS-80 16K Level II			
Ratings:	excellent	very good	good	poor
Documentation				✓
Ease of Use			✓	
Speed			✓	
Functionality	✓			
Support		✓		
Value-for-money	✓			
Price:	\$49.95			
Review copy from:	Dick Smith Electronics			

Compile Positively, With Pascal/MT+

One of the common features of most Pascal compilers is they generate p-code (pseudo-code) for a hypothetical machine, and this code is then interpreted. MT Microsystems' Pascal/MT+ is different; as LES BELL reports, it generates true 8080/Z-80 code.

THE MAJOR feature of UCSD and similar Pascals is that the compiler generates p-code for a hypothetical p-machine, and this code is then interpreted by a run-time system.

Since the compiler and utility programs are generally written in Pascal and consist of p-code, the system can be transported to a new machine merely by rewriting the p-code interpreter.

Very neat, but it has a drawback: speed. Interpreting p-code is slower than executing native code (that is, code intended for the target machine). Another problem is that either the run-time interpreter must be distributed with any software sold, or the user has to buy his own copy.

Under CP/M, object files (.COM files) generated by the assembler/loader or other software can be loaded and run by simply typing their names. It would be great if Pascal programs were that fast, easy to use and easy to distribute.

Microsystems' Pascal/MT+ allows just that. The /MT+ compiler is a multi-pass compiler, like those used for other big system languages, and its output is relocatable code which can be linked with library modules to produce a .COM file. The resulting code is fast.

While Pascal/MT+ is designed to run under CP/M and produce code for CP/M systems, it can also produce stand-alone code which can be burned into ROM if desired. In short, it is a complete software development tool.

An added (optional) feature of the MT+ system is the Speed Programming Package, which consists of an editor and a set of utilities such as a syntax checker and fast compiler. The SPP is designed to integrate closely with the compiler and improve the productivity of a Pascal programmer.

Okay, What Is It?

The Pascal/MT+ package is large — in fact, huge. It is supplied on three 20 cm single density disks which contain the compiler (eight files), the linker, command

files for the linker (kinda like SUBMIT files), library files, SUBMIT files, Pascal source files, and the various programs and overlays which make up the SPP package. After playing around with MT+ for a few days I still don't know what half the files are!

There are two manuals: the largest is for MT+ itself, the other for SPP. The MT+ manual is over 200 pages and is nothing if not comprehensive. It covers just about everything in the package, particularly the extensions of MT+ over Standard Pascal.

The problem is, there is just so much to learn about a system the size of MT+. I feel I've barely scratched the surface and glimpsed the potential. Consequently, this review is only intended to give an appreciation of the package — a long-time user may well have a different view.

Using the compiler is fairly straightforward, but a bit more complex than using, say, BDS C or BASCOM. A Pascal source file is first created, using your standard editor or SPP. The filename extension is .SRC, which caused me a few problems as I give the same extension to my downloaded Source mail; .PAS would have been more logical perhaps.

Next the compiler is invoked with the command line:

```
A>MTPLUS <filename> $(switches)
```

where the switches set various options on the compiler, such as generating a .PRN (listing) file, automatically chaining to the linker, and so on.

For example:

```
A>MTPLUS A:TESTPROG $RB PX A
```

Software Report Card

Program:	Pascal/MT+			
Made By:	MT Microsystems			
Useful for:	Systems programming, commercial programming			
Hardware Req'd:	8080/Z-80, CP/M, 56K RAM			
Ratings:	excellent	very good	good	poor
Documentation		✓	✓	
Ease of Use			✓	
Speed		✓		
Functionality		✓		
Support		✓		
Value-for-money		✓		
Extras included:	Speed Programming Package			
Price:	\$475 (language only)			
Review copy from:	Archive Computer Services, Brisbane			

with its offset from the beginning of the module. If any errors are encountered, the line is displayed. If the file MTERRS.TXT is on-line, a description of the error is printed at the bottom of the screen.

The compiler also accepts toggles as a special form of comment. For example \$! FUNCFILE.LIB would include funcfile.lib into the current compilation, or \$R- disables run-time range checking. Other toggles control generation of recursive code, type and portability checking and space reduction through the use of RST instructions rather than CALLs in generated code.

The output of the compiler is a relocatable code file with the same name as the .SRC file, but with extension .ERL. The relocatable format is similar to Microsoft's .REL files, but there are differences, hence the .ERL extension.

The .ERL file only contains the 'bare bones' of the program. The code for the standard functions and procedures is contained in a series of other 'library' .ERL files with which the main program must be linked to make the final .COM file. This is done by the linker, which is invoked with the command line:

```
A>LINKMT {<main program>}<main program>,  
          <module(s)>,<switches>}
```

For Example:

```
A>LINKMT B:CALC,TRANCEND,FPREALS,PASLIB/S
```

will link B:CALC.ERL, TRANCEND.ERL, FPREALS.ERL and PASLIB.ERL, searching PASLIB.ERL to link only the necessary modules. Finally, it puts the generated code into B:CALC.COM.

The switches specify various options such as specifying origins of code and data segments, generating a .HEX file instead of a .COM file, generating a memory map, and so on.

Standard Pascal Functions

A batch of library modules are supplied with MT+. The major one is PASLIB.ERL, which contains most of the standard Pascal functions and procedures. Other modules are FPREALS, floating point routines; TRANCEND, transcendental functions; BCDREALS, business BCD arithmetic routines; FULLHEAP, ISO heap management functions (PASLIB contains UCSD heap management); DEBUGGER, debugger; REALIO, FPRTNS and TRAN9511 which support the AMD9511 arithmetic processor circuit.

Obviously, command lines for the linker can become long and involved, with the consequent possibility (probability) of error. To overcome this, LINKMT will accept instructions from a command file.

your computer SOFTWARE REVIEW

The command line:

```
A>LINKMT CALC/F
```

will invoke the linker, which then looks for its instructions in the file CALC.COM. That file might contain the line:

```
B:CALC,TRANCEND,FPREALS,PASLIB/S
```

would run the compiler, reading the TESTPROG.SRC from drive A:, placing the relocatable output file on drive B:, put the .PRN file on the console and automatically call the linker.

Keeping The User Happy

The compiler consists of MT-PLUS.COM and seven overlay files, MT-PLUS.000 to 006, which are automatically loaded as required. Compilation speed seems to be disk-bound, so the first two phases of the compiler print plus symbols to keep the user happy by showing it hasn't bombed.

Phase 1 builds the symbol table. Approximately 4 Kbytes is used by pre-declared identifiers, and the compiler will output messages about memory usage. Although small (very small) programs can be compiled in a 48K system, the compiler prefers to dine on a 56K CP/M.

Phase 2 generates object code (a compiler switch allows generation of Z-80 optimised code). As each procedure body is encountered, its name is printed together which would work in the same way as the example above, but with less effort.

Link/mt+ will also link assembly language modules created by the Microsoft M80 or Digital Research RMAC macro assemblers, although it may not operate on the output of compilers such as FORTRAN.

The Key Features...

Pascal/MT+ has a number of features additional to the ISO standard Pascal. Like Pascal/M, it offers a string type and also has byte and word types. Two pre-declared arrays, INP and OUT, may be included in expressions, allowing port-level I/O (definitely tricky and non-portable!).

For operation of programs without CP/M — for example, in ROM — the system provides redirectable I/O through user-written routines.

The compiler normally generates non-

recursive code to conserve space, but a switch may be used to specify the generation of recursive code.

The CASE statement may optionally include an ELSE clause for processing defaults.

Particularly useful for microcomputer software developers is the ability to generate interrupt procedures as well as external procedures. These may be written in Pascal/MT+, assembler or some other language.

In any case, the system contains a large number of additional built-in procedures and functions for bit and byte manipulation, random file access, string manipulation and heap management. For example, an exit procedure is defined which acts analogously to the RETURN statement in BASIC and will exit the current procedure or the main program. If used in an interrupt procedure, exit also reloads the registers and enables interrupts before exiting.

Bit fiddling instructions include:

```
function testbit(var basic var, bit num) : Boolean;  
procedure setbit(var basic var, bit num);  
procedure clrbit(var basic var, bit num);  
function shr(var basic var, num) : integer;  
function shl(var basic var, num) : integer;  
function hi(var basic var) : integer;  
function lo(var basic var) : integer;
```

and others.

More Useful Ones...

Other useful procedures and functions include addr, which returns the address of a variable; sizeof, which returns the size of a variable, record or user-defined type; fillchar, which fills a packed array with a particular character; and length, concat, copy, pos, delete and insert, which are all string functions.

File handling is particularly powerful in Pascal/MT+. The normal Pascal file handling functions are provided, together with extensions which provide high speed byte-level access to files, random access and so on. A curious omission (or perhaps I missed something) is a file rename procedure.

Other miscellaneous functions include readhex, writehex, memavail, maxavail, wait, rim85 and sim85.

Pascal/MT+ is one of the most generally applicable software packages available for CP/M systems. It is suitable for general data processing applications such as editors and compilers, and also for business applications. The user can select at link-time whether to use floating point arithmetic or BCD arithmetic, which is more suitable for business applications as it does not suffer from rounding errors. Where speed is important, the system will operate with floating point hardware in the form of the AMD 9511 arithmetic processor.

In addition, MT+ would seem to be suit-

able for real-time control applications such as communications programs and data acquisition systems. The compiled code is fast and can be burned into PROMs for stand-alone applications where no operating system is available.

An interesting feature of the package is the ability of the compiler to generate extra information in a .ERL file which can be used by a special disassembler program to produce a commented assembly listing with intermixed statements of the source code.

Pascal/MT+ supports modular compilation, with full access to procedures and functions in any module from any other module. A compiler toggle allows the user to optionally 'hide' any group of procedures.

Modules are structured similarly to programs, beginning with the reserved word MODULE and ending with the word MODEND. Variables and procedures in other modules are identified with the keyword EXTERNAL.

Clever, Complex Overlay System

The Pascal/MT+ overlay system allows users to specify that some portions of the program are only loaded from disk when needed. Up to 255 overlay groups can be created, for loading into up to 16 different overlay areas. Overlays can call other overlays into the same area, and the user can even specify at run time on which drives the overlays reside.

However, to provide these advanced facilities, there is a price to be paid in terms of complexity. Creation of overlay code is not recommended for the beginning Pascal/MT+ user — after reading the procedure in the manual I can see why! It's not that complex, but you must absolutely know what you are trying to do.

Another valuable feature for the programmer dealing with special hardware or I/O is the ability of the compiler to accept in-line assembly language and automatically assemble it. For simple jobs, this

removes the need to separately assemble assembly language routines and subsequently link them.

The documentation for Pascal/MT+ is excellent. For such a large package it would have to be! The user's manual is over 200 pages long and makes no attempt to teach the user Pascal; it is devoted entirely to the special features of the MT+ system. It is not light reading, being aimed at the experienced programmer. In short, Pascal/MT+ is not intended for the beginner; it is a professional software tool and the user will have to make a professional effort to master it.

Pascal/MT+ is one of the top-line language packages for CP/M software developers, along with PL/1-80, CB-80, Whitesmith's C and other professional packages. It gives an impression of quality.

We obtained our review copy from Archive Computer Services in Brisbane. The recommended price, including the Speed Programming Package, is \$475. □

The Good Oil on Pascal

The Byte Book of Pascal, Blaise Liffick, Ed., Byte Books, Peterborough NH, 1979, \$39.95.

Byte magazine did a lot to popularise Pascal during the formative years of the language in the microcomputer world, publishing theoretical articles, sample programs and even a Pascal compiler. This book, containing a collection of the best Byte articles on Pascal, is broken into several sections.

The first two sections provide a variety of comments about the language. One of the advantages of this collection of magazine articles is it avoids the highly structured writing style adopted by so many Pascal textbook authors. It is, instead, more eclectic and entertaining.

In the Comments section there is important material by Ken Bowles outlining the philosophy of the UCSD Pascal project (from which Apple Pascal is derived), as well as comment by hobbyist microcomputer users, who often have totally different viewpoints from the academic supporters of Pascal.

Much of the 'meat' of the book is in the second section, which presents general background material, including a com-

parison of BASIC and Pascal and the source code for Chung and Yuen's 'Tiny' Pascal compiler. Written in North Star BASIC, with an assembly language p-code interpreter, this compiler has become something of a legend. The appendix contains full listings, including an assembly language version of the compiler.

The third section contains applications examples, ranging from a computer-assisted dieting program to Frey and Atkin's Chess 0.5 program.

For those into big systems, there's a complete APL interpreter written in CDC 6000 Pascal, while for those with small systems there's WADUZITDO, an interpreter which fits into 256 bytes (with source code in Pascal, of course).

It is difficult, by and large, to write an exciting or different book about Pascal. Most of the academics who write about Pascal do so in the same block-structured fashion as the language itself, leaving few surprises in approach. This book is different, and a useful addition to any Pascal library. We obtained our copy from Computer Galerie in North Sydney.

Pascal User Manual and Report, Jensen

and Wirth, Springer-Verlag, New York, 1974.

The *User Manual and Report*, usually referred to as Jensen and Wirth or just J & W, is the fount of all Pascal knowledge. Although it has been supplanted to some extent with the introduction of ISO Standard Pascal, almost every other writer refers to J & W.

The Manual, which forms the first half of the book, is a concise tutorial introduction, intended for those who already have some experience with other programming languages. It races through the language, giving short examples where appropriate; it has something of the style of a manufacturer's language manual (which, in a sense, I suppose it is).

An experienced programmer with time to spare could learn Pascal from this treatise, and many did. However, it certainly isn't the best learner's text.

On the other hand, it is complete and correct, and it was written by a man who knows more about Pascal than any other. When all else fails, reference to the User Manual will often pull you out of the fire.

The Report, like the Algol Report which set the standard for language specifica-

tion and description, is extremely terse. If you try to read it without giving it your full attention, you'll miss something.

Of course, it is not meant to be read — it is primarily a reference document. Conversely, it is a lot more readable than the Algol Report.

J & W is one of those books you must have on the bookshelf, because even if you don't read it, every other author will refer to it.

Pascal Primer David Fox and Mitchell Waite, Sams, Indianapolis, 1981. \$22.95. Review copy supplied by the publishers.

This large-format spiral-bound extravaganza is an ideal introduction to Pascal for the personal computerist. Making good use of information boxes, illustrations and plenty of spot colour, the text is informative but light. Some of the jokes are absolutely awful, but that's better than some of the academics' approaches to Pascal books which are deadly boring.

The reader is introduced to the ideas of program structure early in the book, without much ado, and realises later how important they are. The pace is reasonably fast, with plenty of examples, written in UCSD Pascal, and having access to a computer enhances the book considerably.

The book suffers from the same problem as all other texts on Pascal — the demonstration programs are all too short to really show the advantages of structured programming in tackling complex problems. Perhaps someone ought to write a book on Pascal which contains only one or two programs (a la Software Tools).

Nonetheless, the examples are practical, and work; they end with a tic-tac-toe game which is a non-trivial example. Another benefit of the book is its honesty, even to an appendix headed *Pascal's Bumpers*. It's also good for those who know BASIC, as it makes frequent comparisons with BASIC to make points clearer.

All in all, a very good introductory text, and highly recommended.

An Introduction to Pascal Neill Graham, West Publishing Co, St Paul, Minn.; 1980. \$15.25. Review copy supplied by the publishers.

Starting from an elementary explanation of what computers are and do, this text takes the reader from scratch to a comprehensive understanding of Pascal. The style is perhaps best suited to use in a classroom as part of a course: the examples tend to be program fragments which are difficult for the beginner to test and follow without assistance from either a tutor or computer.

While many simpler texts are content to deal with just Pascal alone, this book makes some attempt to come to grips with the application of the language to such areas as sorting and searching, with some hidden material on algorithm design.

The choice of typefaces, while complying with the formal standards for published Pascal, tend to give readers of the microcomputer generation the uncomfortable feeling that perhaps the programs have not been run, or that typographical errors may have crept in.

This book is probably more suited to the computer science student than the hobbyist or working programmer. Perhaps a good choice as a second text.

Problem-solving Principles: Programming with Pascal RE Prather, Prentice-Hall, Englewood Cliffs, NJ, 1982. \$21.50. Review copy supplied by the publisher.

Loosely based on the problem-solving principles outlined by the mathematician George Polya, the accent in this book is on program design over program coding. Many textbooks on BASIC, for example, concentrate on the grammar and features of the language, and never teach the student how to formulate a solution to a problem in general terms.

This is a fairly heavy book, but interesting and rewarding. It uses somewhat more mathematical examples than are fashionable these days, in the early stages at least, but there are plenty of other examples and problems from other fields: for example music, stock market analysis, payroll accounting, chess and so on.

The kernel of the book is really Section 4, *The Decomposition of Problems*, which is an excellent study of top-down program design and bottom-up development, the use of types in Pascal and modular refinement.

This is a book that could benefit programmers in languages other than Pascal, although it is probably not the best choice for an introduction to the language. Highly recommended.

UCSD Pascal — A Beginner's Guide RC Holt & JNP Hume, Reston Pub. Co., Reston VA, 1982. \$25.75. Review copy supplied by the publisher.

Programming Standard Pascal JNP Hume & RC Holt, Reston Pub. Co., Reston VA, 1982. \$16.95. Review copy supplied by the publisher.

These two books may be considered together, as they are by the same authors and based on the same basic material. In both books, Pascal is introduced as a series of increasingly complex subsets of

the Pascal language, numbered PS/1 to PS/8.

PS/1 introduces programs that calculate and output, PS/2 introduces variables, constants and assignment, and so on up to PS/8, which incorporates pointers and file buffers. Along the way, the student is introduced to practical problems with Pascal solutions, as well as smattering of algorithm design and computer science.

Programming Standard Pascal is concerned primarily with a batch-oriented system, while most users today are dealing with UCSD and similar microcomputer Pascals, which are considerably more interactive. Therefore many of the examples in the former book have been reworked for the more modern approach of UCSD Pascal.

Interestingly, the first title was printed from camera-ready artwork supplied by the authors from a word processing program, while the UCSD book is actually directly typeset by computer. However, much of the information in the UCSD book is not specific to UCSD Pascal, and in fact many of the features of UCSD Pascal, such as segment procedures, are not even mentioned.

Both books are well written, however, and proceed at a comfortable pace through the use of the Pascal subsets. The UCSD version would be a worthwhile addition to many programmers' bookshelves.

Pascal Programming for the Apple, TG Lewis, Reston Pub. Co., Reston VA, 1981. \$17.50. Review copy supplied by the publisher.

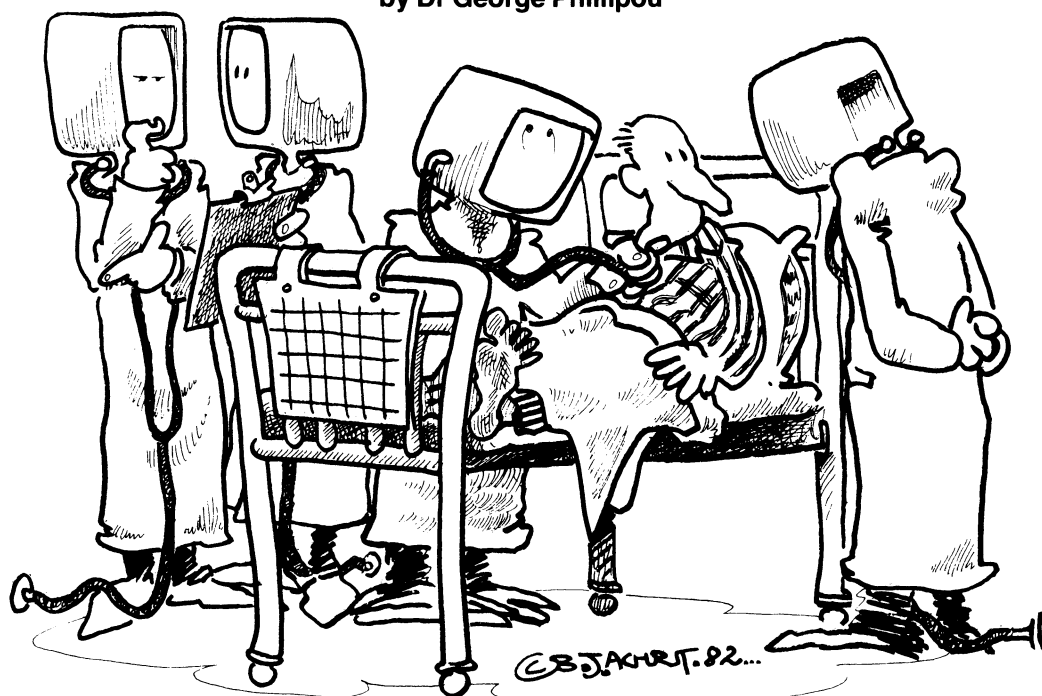
This book is excellent value for the sample programs alone. The introduction briefly discusses the UCSD system on the Apple, and then plunges right into programming. After a few introductory chapters, the author tackles financial applications, text processing, linking large programs, graphics, music and file structures as complex as B-trees.

The material is obviously covered at a cracking pace, but the example programs actually do something, and the reader is left with the feeling that he could do it too, if he just tried a little harder. Each chapter is ended with a question-and-answer session which confirms that the reader has understood it all so far (or, sometimes, that he'd better go back!).

The treatment is light and friendly, and gives the impression that the author has considerable expertise with the UCSD Pascal system. Even without an Apple, using Pascal/m, I got several of the examples to work first time, and feel that the Apple orientation should not discourage users of other computers from buying this excellent book. Highly recommended. □

Microcomputers in the Hospital

by Dr George Phillipou



THE advances in microcomputer technology and the concurrent development of peripheral software/hardware is making major inroads into many professions other than business.

In particular, hospital-based medicine is becoming progressively more micro dependent as scientists, clinicians and administrators begin to note the flexibility, ease and low cost of micro use.

In this overview of the scope of activities for microcomputers in the hospital environment, specific reference is made to The Queen Elizabeth Hospital, a major teaching/public facility in Adelaide's western suburbs.

Dr Betts, of the hospital's Rheumatology department, explained that his department has recently acquired a 64K Apple II, predominantly for word processing of research papers, and second, for storage of patient statistics for future analysis.

Betts, having minimal computer experience, opted for commercial software and chose Zardax and Dr Master. His only criticism was the retrieval facilities of the data management programs were not flexible enough for medicine, where a large number of alternate but important parameters exist.

In the department of Cytogenetics, Dr Callen manages a similar facility. Callen, however, began his professional career as a programmer. Consequently, he has written a specific program to cover the section's needs in storage of patient information as well as pathology test results.

A devotee of Fortran before his BASICisation, Callen expressed surprise at the user flexibility and features of the BASIC language. He still remains mildly critical of the execution speed, perhaps a reason why the department is about to order a Corvus hard disk system.

In clinical chemistry, the largest laboratory in the hospital, computer scientist Colin Wardle and Michael O'Halloran (chief scientist) have combined to interface an Apple II with CP/M softcard and SuperCom II board to a Sequential Multi-Analyser Computer (SMAC for short!).

This instrument, which is the 'heart' of the laboratory, performs up to 3600 tests on 120 individual specimens every hour. The cost of a SMAC is \$250,000.

Continuity Of Service

O'Halloran said their main requirement was to maintain continuity of service. In the past unexpected malfunctions or interruption of the power supply would cause loss of approximately 4000 test results held in the 'buffer' of the system while 'patching' through to the hospital mainframe computer for print-out. Also, the shutdown of the mainframe on weekends meant results accumulated over this period had to be keyboard entered.

Besides the obvious loss of staff time, O'Halloran was particularly concerned with operator error during manual entry. The wide range of results obtained did not readily lend itself to any facile error trap-

ping scheme.

The Apple system, as configured, receives a simultaneous output from the SMAC and stores it on 12.5 cm floppy disk. If there is any malfunction only one test is lost. The Apple is then connected to the hospital mainframe computer, via the SMAC link, and the data output and processed. Each disk can hold seven days of SMAC data, at which stage it is overwritten with new data.

The lifetime of a disk is restricted to 49 days. Before a new disk is used it is checked for faulty tracks, and such. O'Halloran estimates the present working arrangement saves at least 1.5 staff days per week, with total elimination of the manual entry error problem. Individuals desiring more information on the programming techniques involved should contact Mr C. Wardle, C/- Queen Elizabeth Hospital, Woodville, Sth Australia 5001.

Role Of Educator

Discussions with Dr F.F. Seamark, who is conjointly a reader in the department of Obstetrics and Gynaecology (Adelaide University) and Director of Endocrinology, revealed a somewhat different philosophy in respect to microcomputers.

Seamark, in his role as an educator, maintains his students must have computer literacy. By this he implies they must be familiar with the data storage and manipulation features of micros. He notes that on his recent sabbatical leave in England almost every department he visited was us-

ing micros, although mainly for word processing and information storage.

The advantages of the computer in data storage are unparalleled, says Seamark, and remarked on how a visiting English professor brought out his Commodore Pet, complete with data programs.

Unlike most laboratories, Seamark contemplates a microcomputer/pathology test reporting system with 'artificial intelligence'. Due to his past involvement in projects relating the diagnostic capabilities of AI software, Seamark sees no major problems in the implementation of more restricted and specific applications using micros.

Asked about the clinical chemistry application, Seamark suggested a major role for micros would be the control of several instruments simultaneously. Already two software/hardware firms, Interactive Microware and Interactive

Structures, appear to be catering for this market.

Analytical Techniques

In the same department, Dr D.W. Johnson, a senior research fellow funded by the Medical and Health Research Council of Australia, and Dr I. Broom, are collaborating on a major project applying advanced analytical techniques to a study of pregnancy and infertility.

Broom, however, recently left for an extended period in the Department of Obstetrics, Edinburgh, Scotland. The project still continues as each individual performs a specific task.

The information is relayed in an ingenious manner. Broom, a micro enthusiast, took his Apple to Scotland and accesses Johnson's results via modem, by dialing through to the university's main computer. Johnson has ready access to the university system, by means of his depart-

ment's remote terminal.

The research has progressed so well that Johnson has been invited to deliver a paper this September at a major European conference in Israel.

The overall interest at the hospital is so high that a group has been formed, called the QEH Hospitapple Group.

Contact person Don Bisham, who owns an Apple but programs in Fortran on a Data General Nova for his section, says at present the group subscribes to selected journals, but shortly hopes to start learning sessions for the group's beginners.

This story highlights the rapid and favourable acceptance of the microcomputer in one professional area, for while the standard of programming techniques improves it is of no consequence unless appropriately qualified people apply that knowledge to areas of need. □

Making Medical Technology Pay

by Fred Symes

IF ANY bright entrepreneur has a few thousand dollars to spare, I reckon I have an idea which will make rich men of us both.

My scheme is the introduction of a unique product in the home video market. It just has to be a winner — no sweat.

All it requires is cash plus the co-operation of a bunch of hospital doctors and technicians and we will be in clover. Co-operation of some medicos shouldn't be too difficult to secure. So long as the buck is big enough, Ethics shouldn't come into it.

Nor should there be any trouble getting customers. Each year there are thousands of them literally lying around as a totally captive market, as I will explain later.

The unique opportunity I am generously offering to a medium-size moneybags is the production and sale of surgical exploratory video cassettes to patients.

Now I hopefully have your attention, let me explain in a little more detail.

There was a time when physicians and surgeons relied almost entirely on external observations, stethoscopes, a great deal of pressing and pummeling of your body plus listening to your rather vague descriptions of symptoms before deciding whether surgery was or was not necessary.

Despite the myths about the infallibility of doctors, surgical diagnosis really was a hit or miss affair. Some people were slit open quite unnecessarily while others expired within a day or so of the doctor advising: "Just take a couple of these tablets



and you'll be right in no time."

Oh, well, we can't be right all the time. After all, there is only one God and one Pope — or so I'm told.

Aiding Diagnostic Decisions

Now, modern technology has come to the aid of the medical trade. At their fingertips, as it were, the doctors have an array of fascinating devices to help in their diagnostic decisions. Among these devices is the endoscope. This is a long, thin light tube with a lens in the very flexible tip.

The tube is inserted into the cavities of the body via one or other orifice; mouth, nose, anus or whatever. The choice of orifice rather depends on which cavity is to

be explored.

The endoscope can be manipulated by the physician so he can clearly see all those weird and wonderful bits and pieces that make us humans work. He sees it all through a special viewer on the external end of the scope.

But there's more. The endoscope has a special socket to which a video camera can be attached.

Ah, I see you're catching on.

The video camera records in full colour everything the tiny, but nonetheless powerful, lens reveals as it is swivelled around. The video capability means the medicos can later, closer view what they've explored on a big screen, for

hopefully, more accurate diagnosis.

Now then, show me the person who can resist telling everyone they meet all the details they can remember — plus a few they've invented — about their visit to hospital. Give a patient half a chance and he'll earbash you about the pain, the diagnosis, the treatment and the recovery.

Of course, no recovery, no story. I guess that's the luck of the draw.

But rather than try to explain the ordeal verbally, how much better it would be for the patient to be able to show everyone the story. Better still, even should the endoscope probe prove you had nothing more wrong than a reasonably severe bout of indigestion or repressed flatulence, you'd still have something to show for your trouble!

Questions By The Investor

Would anyone buy the videos of their insides? Could they afford them?

Natural questions for an investor to ask, but quite unnecessary, as you will see.

As no one really knows the true cost of this type of diagnosis, the doctors and/or hospitals can charge what they like and the health funds would pay up.

So, to ensure 100 percent sales, the cost of a copy of the video would be included in the diagnostic charge and in a short, dignified ceremony the copy would be presented to the patient, free of charge. At least he'd be told it was free.



To make the video a bit more attractive from a human interest point of view, it would be accompanied by a neatly typed script which the recipient could read to his audience at a home movie night. With a little practice he would be able to make a quite professional fist of synchronising his delivery with the on-screen action.

The script would be as colourful as the film itself and you'd be surprised at the range of bright colours inside your body. It would be couched in terms most likely to elicit heaps of sympathy for the star of the show.

This means, of course, the script might

not be strictly accurate. But as it is unlikely there'll be any doctors among the fireside audience, does it really matter? The excitement of danger, diagnosis and rescue from the brink of death are the makings of a night of first class entertainment.

Attention to Packaging

Attention would have to be given to the packaging of the videos. No plain black plastic containers for these dramatic records of human exploration. No sir.

I see a container in skin tonings to represent the human body. Superimposed on this would be splashes of blood. A scalpel would be attached. It would have to be inserted in a narrow slit in one side of the container to open same.

Apart from the neatly typed script enclosed with the video, there would be a wall chart in full colour showing the various internal organs with a brief description of each. Probably, for a slight additional charge, this could be supplied mounted and framed.

That's pretty much the deal. If you're interested in putting up the money to get this business going, just ask for me in the Victoria Bar at Sydney's Centerpoint Tavern.

We can discuss the carve up over a Bloody Mary or two. ☐

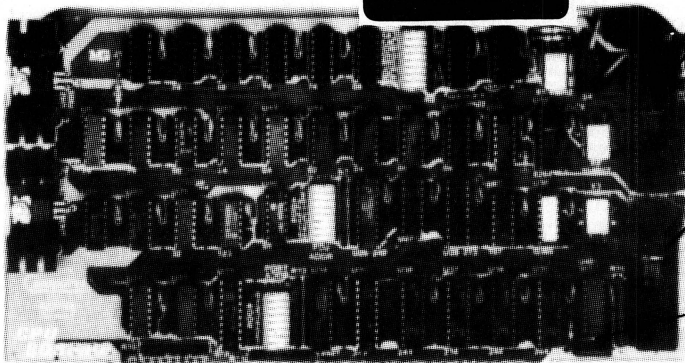
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Freelance journalist ALLAN MOULT first met word processing software in the daily newspaper office situation, and says he took to it like dog to a bone, even if the crashes of system it lived in were particularly traumatic events.

When it came time for Moulton to buy his own package, he attacked the problem with typical Moulton logic: he went shopping for the program, not the CPU. However, the keyboard chose the computer, which was Hitachi's MB-6890 or Peach, and with it came Hi-Writer, which Moulton says is simply...

A Peach of a Program

ONLY three years ago I was first introduced to word processors as a working journalist. I took to them like a dog to a bone.

Here was a machine I could relate to, play with and manipulate to cope with most of my verbal whims. Words became its fodder — to be teased, attacked, altered — at the touch of a key or two.

My fascination and absorption with the process helped me create some articles which have stood the test of time. They still read well today. They're lively, free pieces — unfettered by stilted phrases, clumsy structure, or words of dubious parentage.

The reason is, the word processor gave me absolute control. I could alter, replace, annihilate words without worrying about the end result.

Suddenly, I was freed from the constraints of the typed text, which despite

advances in correction capabilities still did not allow for the creative process. Which writer has not sat up all night typing the final draft, only to discover in the morning that a paragraph is missing, that 'ululate' is not spelt with double 'lls', that the main character's name is spelt wrong, and... Well, it happens, and it calls for an enormous amount of boring, wasted time to correct and retype.

It also induces in many writers a stilted, careful approach which insures mistakes are kept to minimum — as well as keeping creative input to a minimum.

Well, once I had this new power there was no stopping me. There was many a night shift I worked in News Limited's Sydney office, where between subbing stories for the morning edition, I wrote my minor masterpieces on the same machine.

The love affair was fairly short, how-

ever. The mainframe computer system used there was simply overloaded most of the time and had a habit of crashing... and sending manuscripts into oblivion.

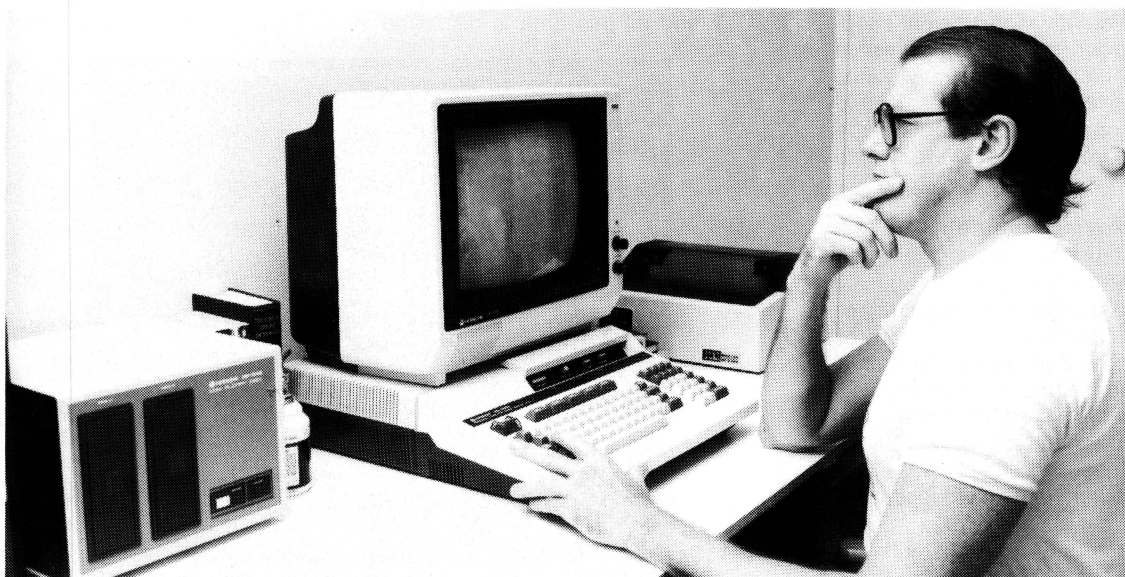
You Learned To Save

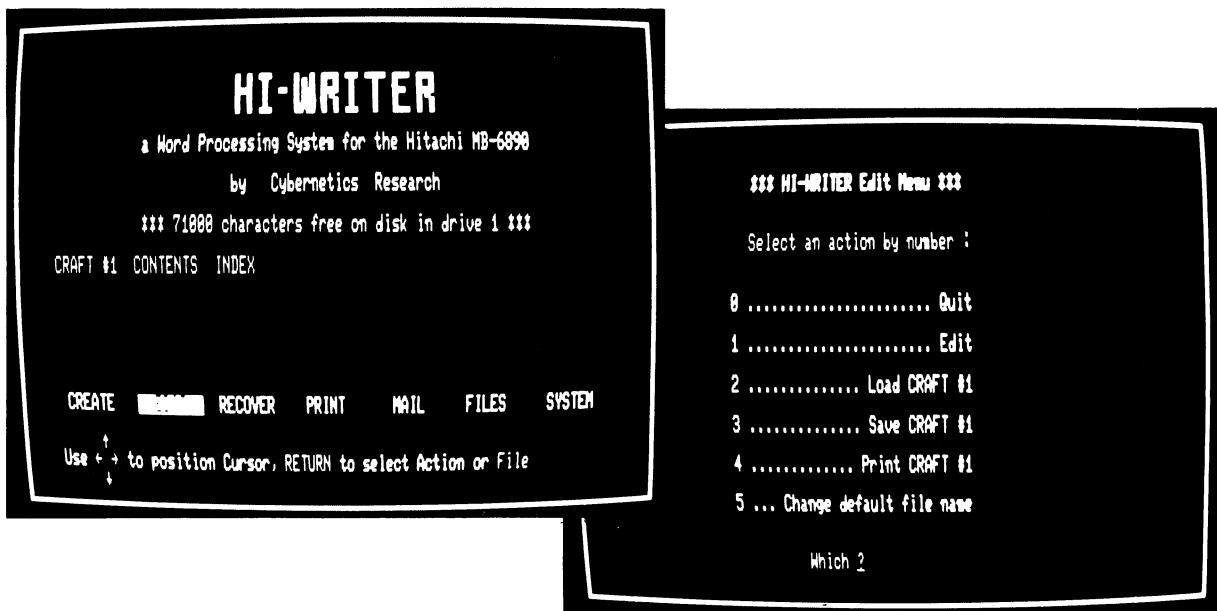
Naturally, after a few occurrences, you learned to SAVE at regular intervals. But, if the muse (or Jack Daniels) has you, one can forget, as I did one memorable day, when, while typing the last paragraph of a 2500-word article, the system crashed.

Gone was three hours of hard effort in one foul swoop of technology. Curses, loud and clear followed, and then it was head down again to meet the deadline.

The system crashed repeatedly that day and it took another three hours to punch it back into the system.

I was reminded of an article by Arthur Calder-Marshall in the Listener in which he said when 'out of sight, out of mind' was





translated into Russian (by computer) then back into English again, it became 'invisible maniac'. The computer and I divorced.

I returned to full-time freelance writing and photography, and spent the next two years gleefully travelling. Technology was limited to trusted cameras and a portable electric typewriter. It was bliss, until I became too successful (well, actually, the retyping of manuscripts was taking just too long and interrupting my trips to Lord Howe Island, Kashmir, California and Woop-Woop).

My mind wandered back to those halcyon days when I first discovered the word processor. I decided to buy my own, stand-alone, uncrashable (through system overload at least) word processor.

A simple process of financial elimination soon discarded the dedicated business machines and narrowed the final choice to a microcomputer with a word processing program.

With typical creative logic I went shopping for a program, not the CPU. It was a long process and I looked at many. While all had good, even great features, I could not stand the operating keyboards of the bulk of the computers they were locked into.

Directional Arrow Please

When I want my shiny little cursor to go up or down, left or right, I want an arrow key to hit that's pointing in the right direction, not an alphabetical key! Too many of the available microcomputers had limited keyboards, forcing the regular keys to double or even triple their functions!

Then I met Hi-Writer . . . and naturally, in passing, the Peach — Hitachi's MB-6890 personal computer, with its whopping 87 keys. They're capable of typing in 281 different characters. But of most interest to me were the cursor controls.

This story has been keyed in using the Hi-Writer program, and it has been a free-wheeling exercise.

My raw material has been punched in with little regard to the final look of the article. The only visual indications I have of what's happening are the paragraph breaks.

Before I began typing I decided the width, margin and paragraph indents I wanted on the final printout. That's a simple task involving, for example: ESC10M — for a 10 character margin; ESC65W gives me a 65 character width count, and ESC3N gives me a three character indent.

In the unformatted mode I simply type in the raw material. When I want to see what it will look like in the format mode, a simple ESC F flashes it on screen, with underlines in red.

To find out how many characters of text I have free in each disk sector, the memory available at any instant and a reminder of my format instructions, I simply key ESC T and all this data is displayed in

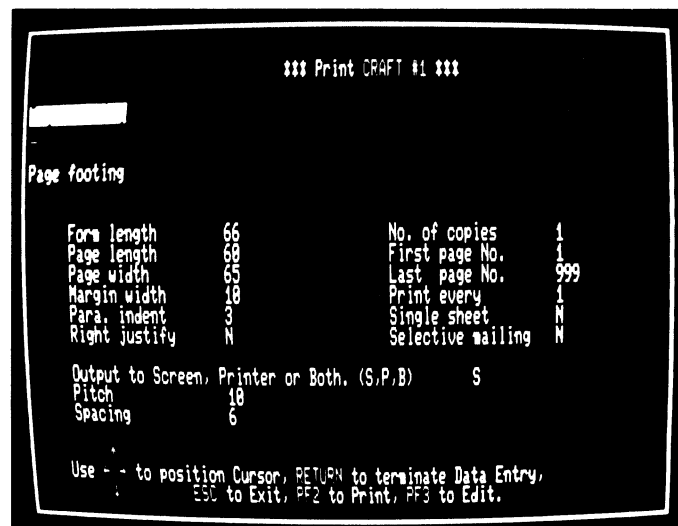
yellow at the bottom of the screen. You can keep it there for the duration or release it again with ESC T.

Formatted Display

In the unformatted mode, the text is displayed in pale blue, with embedded control characters displayed in red.

Checking the formatted version visually is as simple as ESC F. It flashes onto the screen in white text, so the effects of the embedded control characters, rather than the characters themselves, may be seen. In formatted display mode, underlined text is displayed in red, bold text in dark blue and underlined bold text in purple. The width, margin and indent, and right justification can be adjusted again — and the results reappear in an instant. The Hi-Writer and Peach combination is fast!

Meanwhile, the formatted display does not alter the text in the buffer, which is stored unformatted. So there is no need for reformatting again in the work mode. Text is reformatted automatically and in-



stantly on every keystroke. Words are wrapped around as you type.

And that reminds me, text can be inserted anywhere in the file by simply typing it in as Hi-Writer defaults to insert mode. Gone are the hairy days on News Limited (and on a couple of other systems I tried) where a simple error could see wads of copy disappear, never to return.

Talking of errors, recovery is simple with this system, Ctrl W restores text to the right, and Ctrl Y, text to the left. This is very handy for those occasions where you hit the Ctrl key and A at the same time and suddenly find a whole paragraph gone into the void. It's an unfortunate placing of the keys, but you soon adjust.

The bidirectional restoring functions are typical of the system: most editing functions, including deletion, screening, tabbing, searching (single character, word at a time or paragraph) can be done in both directions.

Numerous Editing Commands

There are numerous other editing commands, particularly when you remember Hi-Writer also includes Hi-Mail, which enables the user to do amazing things with text merges for form letters. But that's another story to be followed up.

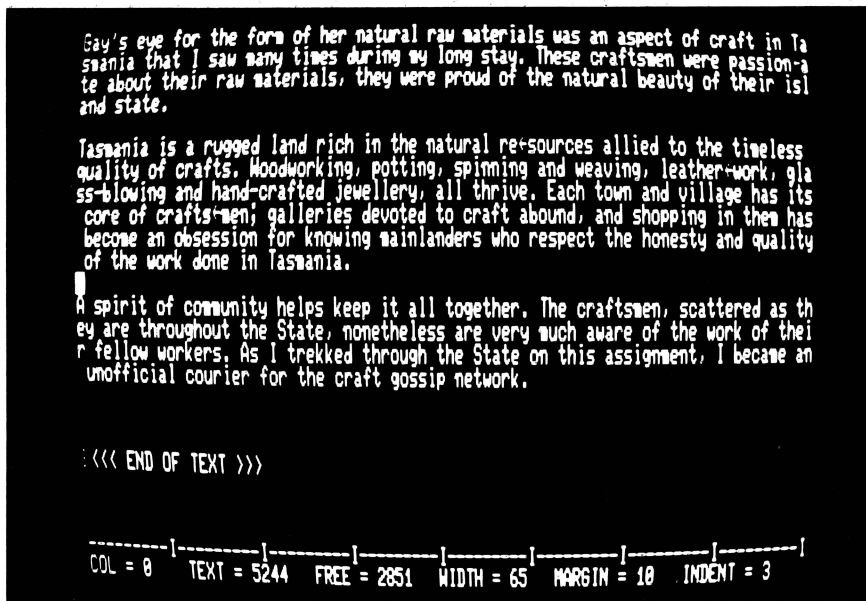
For those interested in the basic structure, the Peach and Hi-Writer offers a full colour 80 column screen using in-

terlaced video to give fully-formed upper and lower case and special characters; the full function keyboard has upper and lower case, a numeric keypad, full cursor control, programmable function keys, a 30-character buffer and acoustic feedback with volume control.

Other bonuses include super-soft spaces which give automatic centring of text (which remains centred even after

margins or width are altered); global search and replace; block delete, move and copy; automatic, semi-automatic and manual hyphenation for complete hyphen control; full help available on-screen when you need it; and automatic widow-orphan protection.

I went shopping for a program and came home with a Peach. It's an amazing system which I am still exploring. ☐



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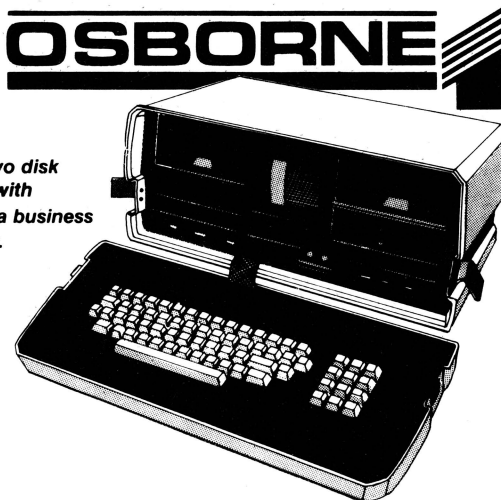
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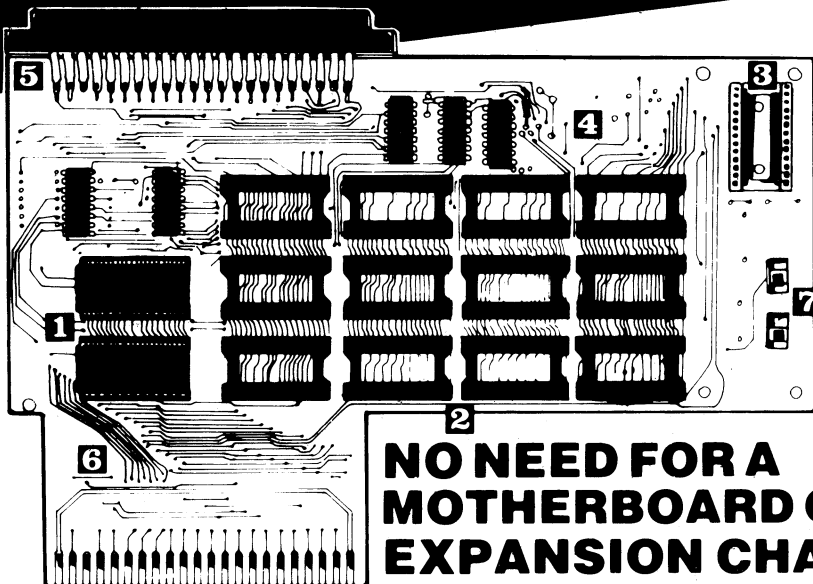
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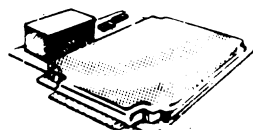
FEATURE

The RS232, fully-implemented interface that we offer contains a master power unit which can double Vics ability to support add-ons and has an external socket to allow the supply voltages plus 5V, plus 15V-15V to be used for other devices, memory expansions, cassette drives, light pens, printers etc.



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VIC-MEMORY 19k

This memory expansion allows the user a large programming memory, 16k of which is battery protected so that programmes may be kept in memory for up to 1 year even when the Vic is unplugged. A 4k removable module is incorporated which has its own battery back-up circuit.

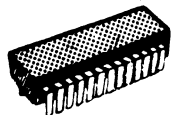
Switches allow the memory to be configured at various locations thus making use of VICs auto-start ability.

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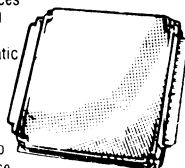


VIC-MEMORY 3k

Small size-Low cost memory expansion. Plugs into Vic and reproduces memory-port. Can be used with other expansions. Gives a total of 6k user static ram on Vic.

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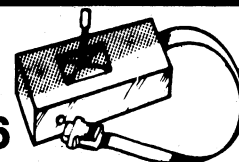
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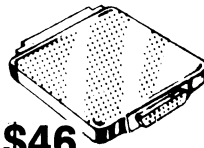
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A two into one adaptor for use with both joysticks and light pens. A must for those who require full control of games with graphics.

FEATURE Low-cost, high-quality-Robust-Stackable.

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This unit whilst very low cost does not cut corners in performance but uses true positive and negative data states. The interface is configured as a conventional pin-out to a 25 way 'D'-type connector.



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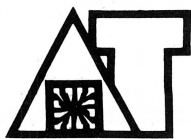
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MicroBee - Superbly Expandable

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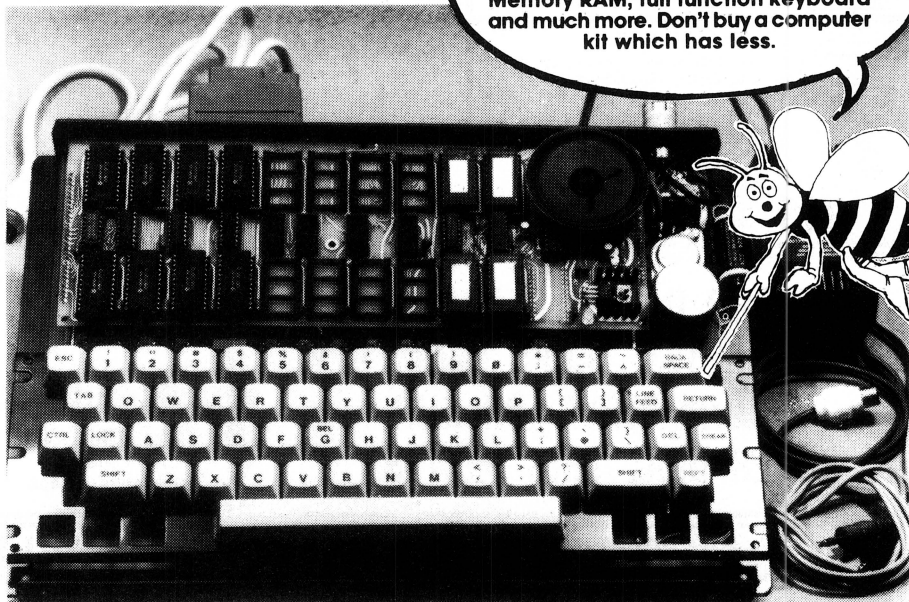
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So You Want To Buy A Second Hand Micro?



The outlay for a personal computer is a major one by any standard. It's a purchase which is often hard to justify in a domestic situation; if more than one member of the family holds the purse strings, acquisition can be unpopular.

Retail discounts and sales reduce the cost somewhat; but if your budget is still tight, a second hand purchase could be the solution, says **DEREK MORRIS**

CARE MUST be taken when purchasing anything second hand and computers are no exception.

However, there is no need to be too sceptical. Unlike used cars and other items, the character traits of the previous owner rarely show up in the performance of the unit. So the computer owned by 'a little old lady' should perform just as well as one owned by the apprentice bricklayer — assuming both owners were not given to violent games of space invaders (or Interlude for that matter!).

Computer owners tend to have good reasons for selling their units. Updating

hardware is a constant process for some, while many sell their units because a trade-in facility is not available or the price was too low.

Some people lose their initial interest and enthusiasm, and the price is often an indication of this. People also sell because of financial strain. Whatever their reasons, it's seldom that the computer was faulty.

Not only can a saving in price be made when purchasing second hand, for the price of a given computer purchased new, a buyer may be able to purchase a more sophisticated model second hand. For example, the retail price of a 16K Sinclair ZX81 is \$400. For the same price the second hand buyer could purchase a used System 80 or TRS-80. In the same vein, rather than purchase a System 80, why not aim at a used Apple II?

Many Extras Included

It is more than likely that a stack of software will be included in the purchase price of the second hand micro. This is a bonus which must be considered in the price of the purchase. If you were to purchase the software separately, it could cost you a small fortune.

Another bonus is that the previous

owner will be well versed in the operation of the unit and will often be more receptive than a retailer when it comes to hints and advice on using the micro.

However, purchasing is not without its problems. Be sure to test the unit thoroughly before purchasing it — once you hand your money over the seller cannot be expected to hear out your complaints.

You should not assume specifications like the RAM or ROM size. Many computers have different internal specifications within a model range, with no apparent external difference. A novice (or for that matter an experienced user who's keen to make a purchase) could easily be led to believe he is purchasing a TRS-80 Model II, when the unit is really a Model I; or a supposed 16K system that's really 8K.

Assuming you are satisfied the computer in question is the real thing, take steps to ensure it performs in a similar manner. Load as many programs as time permits (both BASIC and machine language) and establish that they all load and run properly.

If the computer is fitted or being sold with a cassette player, attempt to load a program which resides towards the end of a tape. This will indicate whether the tor-

que of the player is up to scratch. Have a good look at the head, capstan and pinchrollers on the cassette player. Not only will this reveal any wear; it should give you an idea of how much use the computer has had.

Be sure to get a good feel of the keyboard of the computer. Check for 'bounce', especially on the letters E, T, A and S. These are the most frequently used keys, so it's here that the problem will show up the most if it's present.

If you're purchasing an early model system 80, it's likely that two extra keys have been added to the keyboard — the tab "7" and Clear. If so, they may have been installed by the owner and not by a service centre.

"It's Mint Condition, Sir"

This brings us to the point of user modification and construction. Beware of radical changes to the basic configuration. Some may seem attractive initially, but should they fail, other components may get taken with it. Repair could be both expensive and a headache.

There is no accounting for skill in performing modifications. Some people can turn a simple modification (such as insertion of a level control for the cassette port) into a maze of wiring and messy solder joints!

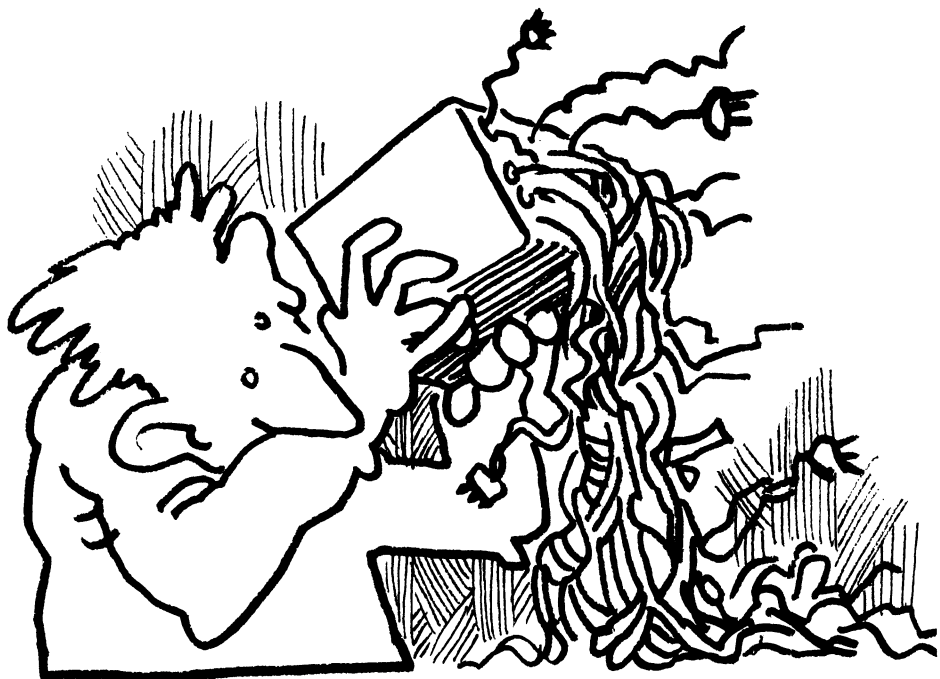
It is becoming popular to expand the memory size internally; this can be achieved with a kit, but such changes could well be disastrous if they have been performed by a novice. If at all possible, have a look at the PCB. If the computer was built in kit form, insist on it. A quick look will soon determine the owner's dexterity (or lack of it).

Beware of screws and components sealed with blobs of nail-polish as it suggests the obvious. Components that outshine others have a good chance of being a past mishap.

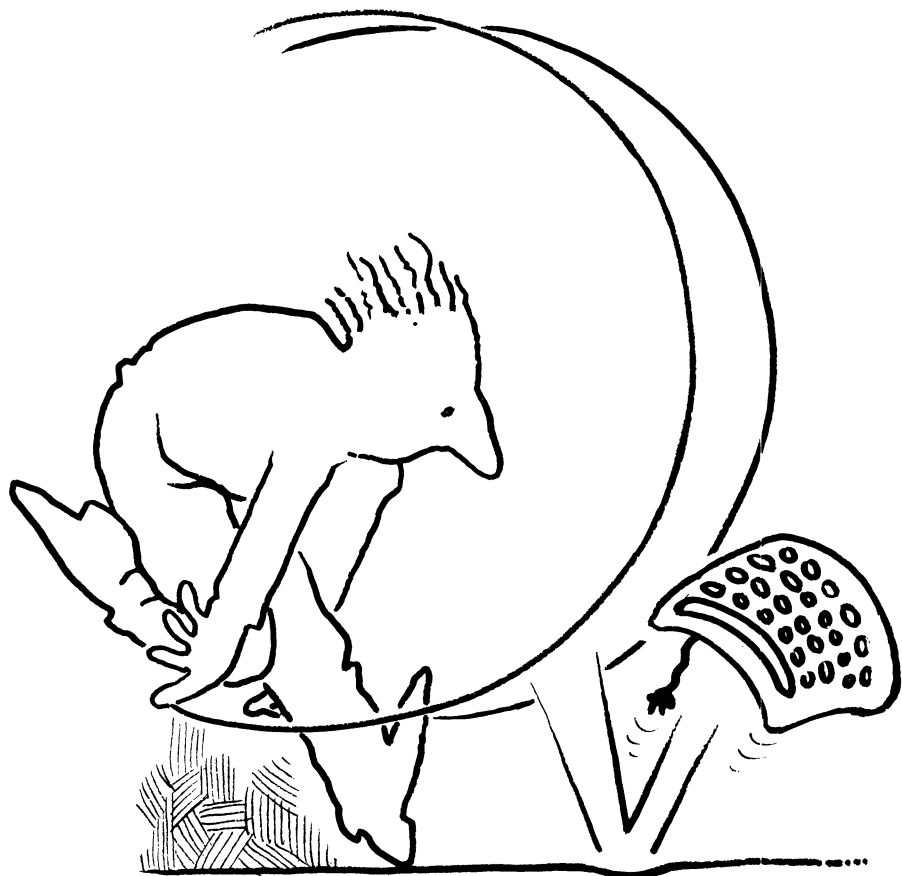
Although repair and modification may not be a bad thing in itself, it must be kept in mind for an overall assessment of the unit. It will also be an excellent reference should it be necessary to haggle over the final price.

As a rule, do not accept the advertised price. A person selling something will mark up the price to accommodate someone who likes to bargain. Even retailers will, at the very least, usually drop the price to the nearest hundred or throw in some software to clinch a sale. If the purchase is from a retailer, a guarantee is often available, usually at a percentage of the price (around ten percent).

Given a little care and thought, a great saving can be made by purchasing second hand. The obvious benefits of new equipment is not present, but the saving made could be put towards the expansion of your system. In that case you, the new owner, will be a step ahead. ☐



MODIFICATIONS: A MAZE OF WIRING AND MESSY SOLDERING JOINTS....

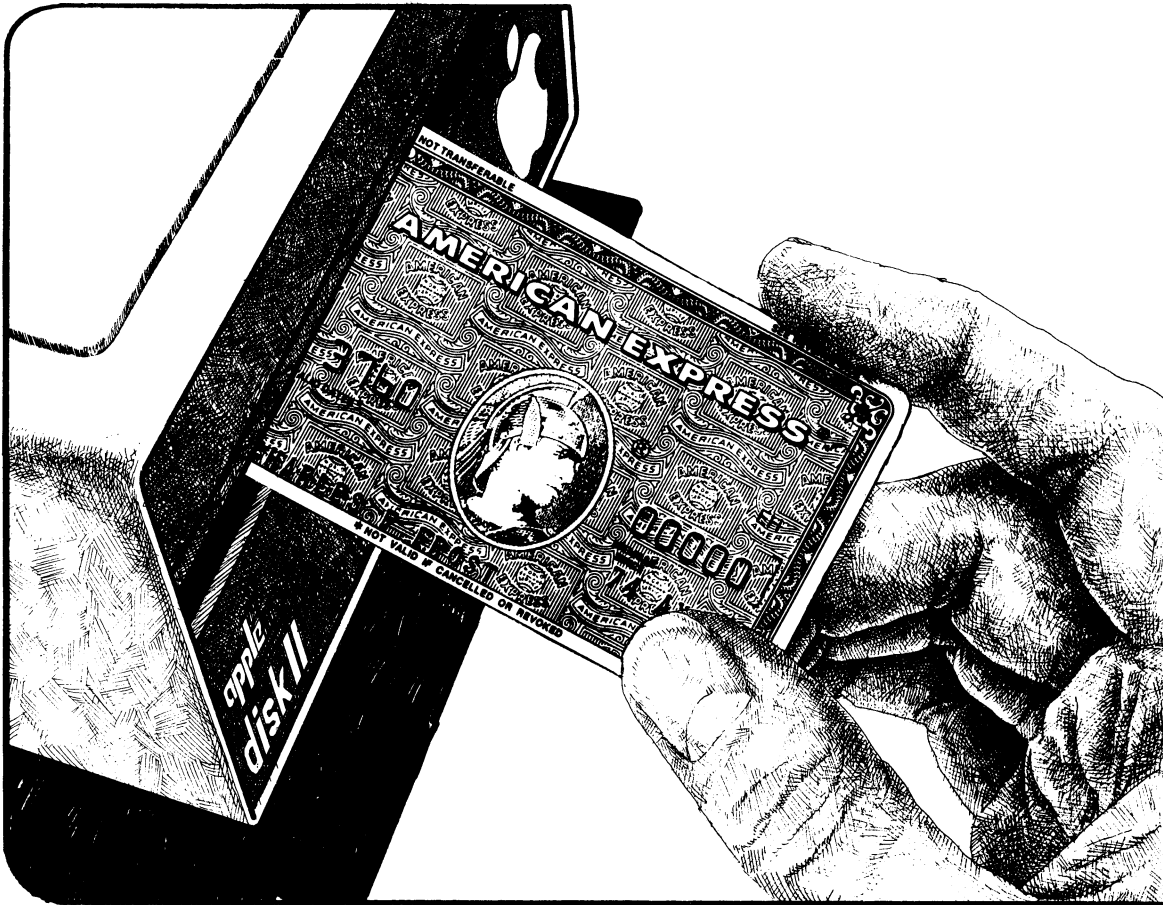


KEYBOARD SHOULD NOT BOUNCE

Sophisticated Micro

How An Apple Made It At AMex

By Jennifer Adelstein



INTEGRATING a microcomputer as part of a sophisticated time-sharing network system is an unusual application for a personal computer; but for Warren Kable of American Express it was not merely a gimmick, it was a real necessity.

This novel use of a micro for sophisticated business applications emanated from the time-consuming functions of planning and forecasting which, like all things, American Express does thoroughly and with tight deadlines.

Planning and forecasting involve very refined business numbers and include projected revenue and business, cards in force, new cards and budgeting: in fact every aspect of business analysis.

Statistics from the accounting department are analysed to project business for three months, as well as the calendar year-end figure. On a monthly basis, the quarterly figures are reviewed and up-

dated with input from planning director Warren Kable, planning officer Graeme Young and the marketing personnel.

This ongoing task took two days each month as a manual 'number-crunching' exercise. A large amount of statistical information needed to be collected and collated, then cross checked to determine if it fitted in with current business patterns.

As part of the forecasting synthesis, rather than analysis, financial modelling is used to pose 'what if' questions to assist in the sophisticated planning operation. This was performed manually and involved considerable effort.

Budgeting was performed on the GEIS Mark III ITN, but most of the data had traditionally been organised with access to the GEIS time sharing database. However, the data had to be organised manually before being input to the worldwide network.

Although the GEIS computer has an extensive range of powerful tools used by AMex for modelling and forecasting, the need had arisen for a high-volume low-cost device to supplement the Mark III's facilities.

Time Spent Doing Numbers

The problem, as Kable perceived it, was too much time spent doing numbers, rather than understanding them and conveying their meaning to others.

"We felt we were in the middle of a long pole with financial people at one end and personnel at the other," Kable said.

"We were metaphorically rushing around from one end of the pole to the other, trying to bridge an information gap without the proper tools to do it effectively."

This was soon to change, however. In July 1980, on route to an American Ex-

press worldwide finance and planning conference in the US, Kable visited AMex's UK centre to check out the Apple application there.

In the UK the company was using an Apple computer for the business applications of consolidations and multi-currency conversions. That set Warren Kable thinking along the lines of utilising a microcomputer for financial modelling, but within the integral operation.

But could it be used alongside the GEIS computer as part of a complete system, rather than as a peripheral and secondary facility?

The possibility of using a personal computer — one primarily for home use by enthusiasts rather than for a sophisticated business application — became a probability as Warren began investigating Apple hardware and software available in Australia.

More Research, More Feasible

The more he researched this possibility, the more feasible it became to use the Apple for both small scale local financial modelling and as an access terminal to the Mark III network, while communicating with the company's own computer.

Graeme Young became involved once Kable had decided the Apple offered the best solutions for the company in both hardware and software.

Having already completed a computer course as part of his university degree, Young assisted in reviewing the language which would suit the proposed AMex application.

Specification of the overall system (models, micros, Mark III and integration at a conceptual level) involved John Smyrk, a GEIS senior consultant. He converted AMex's broad objectives into an operationally functional computer tool entitled ADSS (AMex decision support system).

Smyrk, as principal of Sigma Management Science, has acted as consultant to some of the world's largest companies in similar situations.

Corporate modelling software packages — to date used mainly on mainframes and minis — can now be used on micros for novel applications rather than just feeding in data to obtain a pre-determined report. Standard Apple software like VisiTrend, VisiPlot and VisiCalc enable the micro to be used for sophisticated decision making.

John Smyrk says: "I feel justified in saying the American Express applications are unique. While there is bound to be somebody who has done the same or similar things on micros, this is probably the first time such a high level of sophisticated modelling has been attempted on an integrated micro oblique time-

share system."

The Apple II, which was installed in December 1981, has dual diskettes and 64K of memory. It communicates with the Mark III network and permits the GEIS facility to be used in the same way as the integrated time-share terminal.

"For the first two weeks it sat there," said Kable. "It was the holiday season and people were on vacation, which I suppose justifies the fact that we were reticent to start using the Apple."

"Initially, we had lengthy discussions with senior management to convince them of the need. Head office in New York and the branches throughout the world were interested in our plan, so it was no wonder we were hesitant to take the plunge. We felt the eyes of the world were upon us," he said.

Exciting Developments

Once Kable and Young sat down with the Apple, exciting things began to happen in planning and forecasting. Formulae and figures were input and different model scenarios were now available for forecasting. Manual modelling and number crunching became things of the past.

Time-saving benefits were immediately apparent. The two-day stint was reduced to half-a-day, but as the system is very much in development mode, the time

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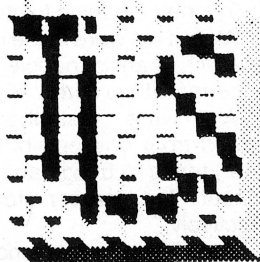
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saved is poured back into the learning curve. Kable feels the full fruits of financial modelling will not be experienced until the end of this year.

In the meantime, the planning team is discovering the variety of ways one software package can be used. VisiCalc, which enables the setting up of information in table format for mathematical manipulation, is now being used in conjunction with the new MicroModeller package, permitting larger integrated models to be built on the microprocessor.

The Apple is also used for the preparation of the annual plan, setting the scenario for 12 months, and for the monthly forecast system which projects three months ahead. The Apple will also be used for a five-year business plan.

Within the first two months of installation, senior management in the Australasian region acknowledges the potential of financial modelling, and fully supports the Apple as a management tool and business control device. Within those first months, it was realised that this new tool in the planning and forecasting department facilitated decision-making at higher management levels. Gone are the days of gut-feeling decisions alone.

A management information service is now provided, broadening the decision-making base for everyone in the company.

Total Concept System

The full financial modelling system includes forecasting and budgeting. Initially it was on the Mark III, but it is now to be shared by both the GEIS and Apple, creating a total system concept. The combination of the two computers enables the Mark III to be used mainly for the network and large scale applications, while the Apple is used on smaller and ad hoc projects.

The integrated system is being monitored from the New York office, potentially for use in other AMex situations.

Already Warren Kable and his team are gearing up for similar systems to be installed in the South-East Asian regional office in Hong Kong and branch office in Singapore by the end of this year.

The biggest problem for the American Express team is making time to fully develop the potential of the Apple.

"We were not given on-the-job training and support in our own environment," said Kable. "We used the manual to get us going, but on-site training would definitely have been an advantage."

Rudi Hoess, managing director of Electronic Concepts — Australian distributor of Apple products — says his organisation is responding to changes in the marketplace. Initially, Apple systems were sold to individuals who mainly wanted to find out things themselves. But recently there has been explosive interest

in the business sector.


"Management personnel expect to be trained on site," said Mr Hoess. "This expectation is quite justified. We believe they shouldn't have to sit and sweat over the machine while they become accustomed to its capabilities."


Alternative Training Emphasis


Electronic Concepts is very much aware of the altered training emphasis and is catering to the change in three ways. First, training classes at Elcon's Sydney office are available to all Apple users, and many companies are taking advantage of them by sending groups of personnel for training. Second, a national account support team assists companies in getting their systems fully operational.

The third response is in the training of part-time employees (on both hardware and software) who will then supply on-site training. This is a recent happening and was not available at the time AMex required it.

Despite this, American Express has overcome the initial problem and its staff is now using the equipment with confidence. The planning and forecasting department can now create comprehensive plans for the future, rather than just budgets and number crunching exercises. □












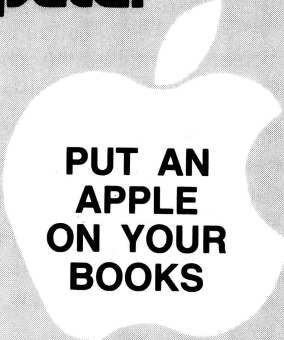


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
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

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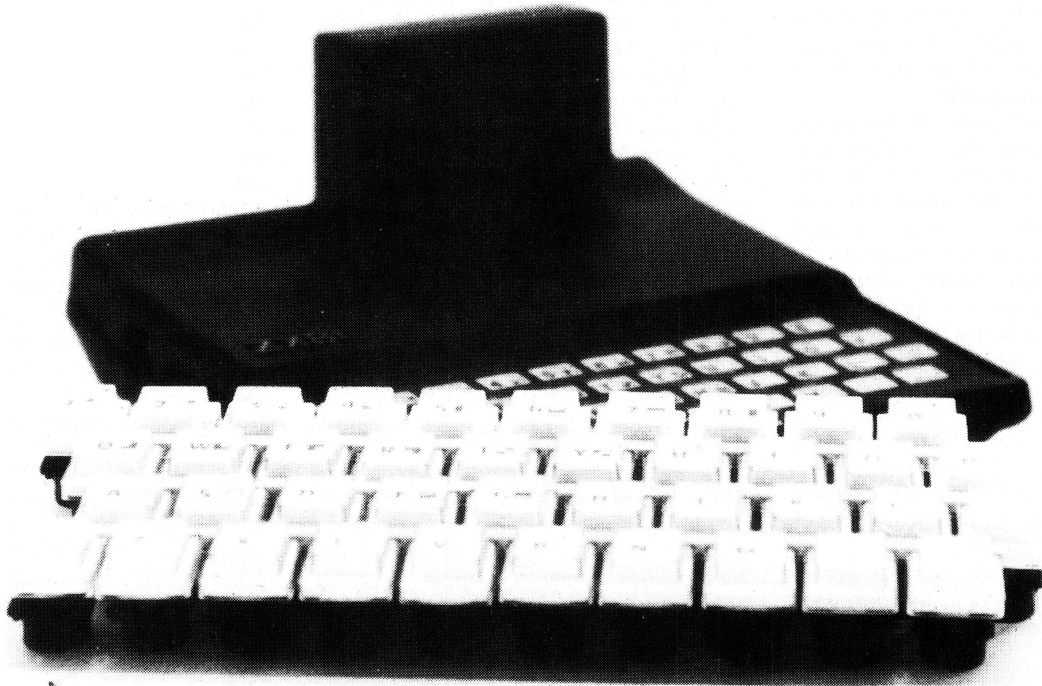
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It's ZX80/81 With Feeling – With A New Keyboard

by Graham Webber



Are you a Sinclair user who's frustrated by the tiny ZX80/81 keyboard and its lack of tactile feedback. GRAHAM WEBBER was becoming one. . . until he discovered an after-market keyboard for the ZX80 and 81.

LONDON, June 1981. That was when I bought my ZX81.

I'd explained to the Sinclair agent how I was just passing through and couldn't possibly wait the usual eight weeks delivery time for Sinclair's newest brainchild, so could he please supply one over (or under) the counter?

Fortunately he relented, supplied a kit set in return for cash, and wished me lots of luck.

Well, I guess I was lucky. After purchasing a VHF modulator (the kit was supplied UHF) and engaging in a few hours of very careful soldering, I had what was possibly the first ZX81 in Oz. What's more, it worked the first time it was fired up.

Then came the problems.

First, no software! This meant I had to write numerous letters to people in England begging copies of software which might work on my machine. Also, I had what I considered the awesome task of converting locally available ZX80

software to ZX81 format. What a nightmare!

Next, that dreadful keyboard!

The original ZX81 keyboard is of the elastomeric design. This means it is simply a plastic or rubber sheet laid over a printed circuit. Apparently the sheet is conductive. When you depress the area over a particular character, the sheet makes contact with the printed board and completes the necessary circuit — just like a rubber switch.

The keyboard's operation is completely silent. There is no audio indication that a character has been entered. You don't receive any tactile feedback either; it just seems dead. You have to look at the monitor after each entry to ensure the entry has been accepted.

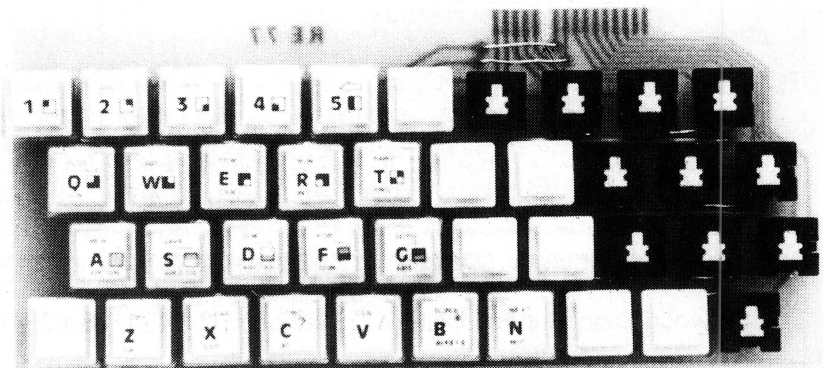
But since I've bought the ZX81, I've found more and more pressure was required on the keyboard to make the computer respond. This problem, however, may be peculiar to my machine only.

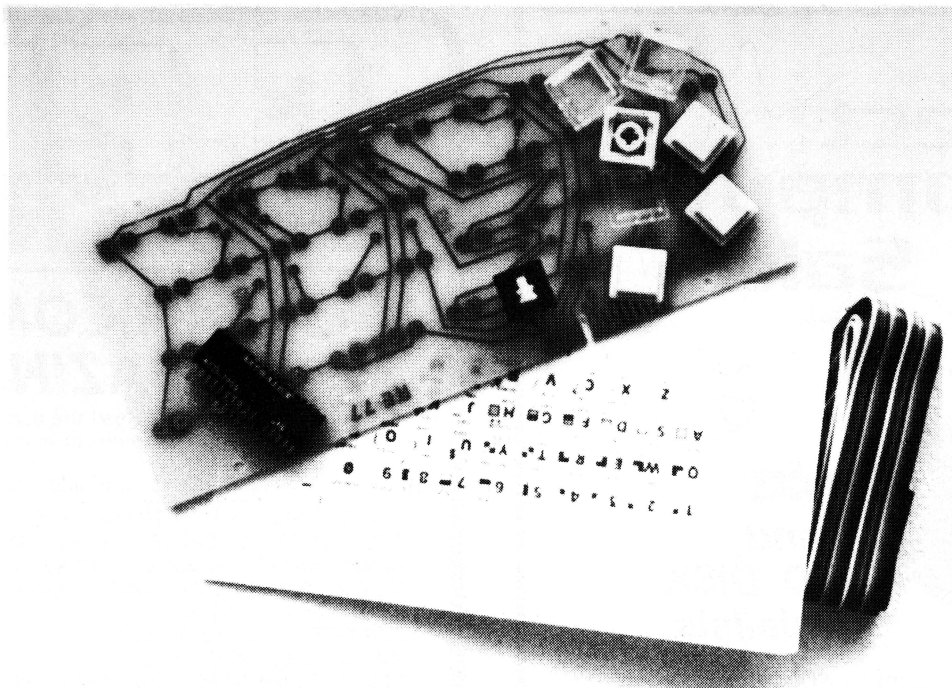
Furthermore, although the keyboard is laid out in the usual QWERTY manner, it's so darn tiny that anybody with normal sized fingers has great difficulty in using it in anything other than a 'hunt and peek' fashion.

Solution: A Viable Alternative

It seemed the only solution was to throw away the keyboard. This in turn would mean locating an economically viable alternative.

Some time later a friend drew my attention to a British magazine displaying an





advertisement for a keyboard which might solve my problems. After deciding the price was reasonable, I sent a bank draft to the manufacturer and promptly forgot the matter.

The package was delivered by Australia Post a lot sooner than I had expected. The contents were well packed and adequately protected by a fairly sturdy cardboard container, so no damage resulted from the infamous handling it must have received in transit. A manufacturer concerned that his products reach their destination in good condition is an immediate plus!

The contents included pre-drilled printed circuit board, 40 key switches to match, and an edge connector. Also included was a more than adequate supply of ribbon cable, a length of bore link wire, some spaghetti tubing, keytop logos and even a length of solder. Last, and very important, was a set of instructions for fitting of the keyboard to either a ZX80 or a ZX81 machine.

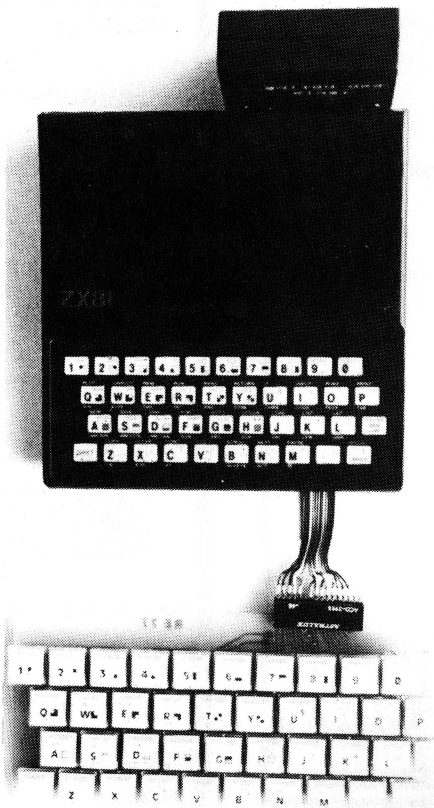
Ease of Construction

Construction was easy. First, fit 16 short links to the circuit board, and two spaghetti covered long links. Then insert and solder the 40 key switches and press on the white key tops. Last, solder a length of ribbon cable between the edge connector and, in the case of a ZX81, the underside of the original keyboard connectors. Electrically, you're finished. Plug it in, turn it on, and it works!

Now for the key tops. Each white key top has a snug fitting clear plastic cover. You are supplied with a printed legend set which corresponds with the legends on the normal ZX81 keyboard. The legends are cut to size — using the guide marks

included — and inserted onto the clear plastic covers. The plastic covers are then pressed firmly onto the white key tops. This completes construction of the new keyboard.

So at last I have an inexpensive computer which I no longer consider to be a toy. The keyboard clicks audibly when I use it, and I can *feel* that a stroke has been entered. Now I only look at the screen to check for syntax errors at the end of a program line.



These days I've even started using some of the games programs that I'd thrown to the back of a shelf in despair. Most games programs involve inputting either 5, 6, 7, or 8 in response to conditions dictated by the video display. Usually the decision on which key to use has to be made quickly; but although it was easy enough to make the required decision, on the old keyboard it was extremely difficult to locate and depress the correct key before conditions changed. . . Now I can destroy aliens with the best of them.

It's All Changed

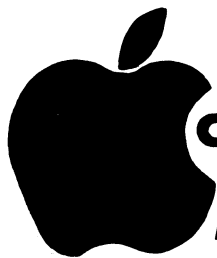
However the most important advantage of this new keyboard was in learning. I bought my machine because I wished to learn something about computers. Like many others I couldn't afford around a thousand dollars, so the ZX81 seemed ideal. Unfortunately, I found my enthusiasm was flagging at approximately the same rate as my frustration with the original keyboard was increasing.

All that has now changed. At last I'm starting to learn new things about computers. I feel sure that this is due to the new keyboard — the fact I can keep my head down until the end of a line is a great help. I'm no longer concerned with the problem of non-entry because I can actually feel my key strokes coming up on the screen. It's a great morale booster.

If you have a similar problem, and would like to blow the dust off your ZX80 or ZX81, I would recommend you take advantage of the keyboards that are now available.

Mine came from Redditch Electronics, 21 Ferney Hills Avenue, Redditch, Worcestershire, England. Price was £22 plus £2 airmail postage.

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UNDERSTANDING ASSEMBLER

PART III

In last month's article LES BELL introduced the complete instruction set of the 8080 micro-processor: this month he starts programming.

THE CHART at the end of last month's article shows each of the possible op-codes for the 8080 in hex (the preferred counting system), octal (for old fogies like me) and decimal (for those who have no assembler and must POKE programs into memory).

With the aid of this chart we can now start writing useful programs. We'll start with some arithmetic — for no other reason than it's equally useless to everyone, but doesn't require any special hardware.

Languages like Tiny BASIC, tiny c, C and Pascal have an integer data type; sometimes that's all they have. In general, this uses a 16-bit integer expressed in two's complement form, because that's easy to implement on an 8080 (for a complete run-down on two's complement arithmetic, see part two of Binary for Beginners, in YC December '81).

First, let's look at addition. Remember the 8080 can use the BC, DE and HL register pairs as 16-bit registers, with the added ability of 16-bit addition, using the HL pair as an accumulator of sorts. The major limitation is that 16-bit arithmetic does not affect the carry and other flags — but as our arithmetic is limited to 16 bits we won't want to carry anyway.

Assume we want to add two 16-bit numbers; how do we go about it? First, we get the two numbers into the HL and DE registers from memory or wherever they were. The details of this procedure depend upon the rest of your program. Then a DAD D (double precision add DE to HL) instruction will add the numbers together, leaving the result in HL. Where the result is moved after that depends upon the rest of the program.

So, our 16-bit add routine looks like this:

A16 DAD D

Written as a complete assembly language file, we have:

your computer



tutorial

; addition example

```
org      0100h
a16:     dad      d
end
```

The first line, as you will remember, is a comment. The org statement tells the assembler to place the machine code at location 0100 hex and onwards, and then comes our 'program'. The next stage — after creating our source code file using ED, WordStar or some other editor — is to assemble it, using ASM or MAC.

The result will be several files; A16.PRN, A16.HEX, and if MAC is used, A16.SYM. The .PRN file shows the resulting object (machine) code against the source code, thus:

```

;      ADDITION EXAMPLE
0100      ORG      0100H
0100 19    A16:    DAD      D
0101      END
```

and the symbol table file shows the addresses and values of all labels and symbolic constants:

0100 A16

The important file produced by the assembler is the .HEX file. It contains an ASCII representation of the machine code, together with information about load addresses and checksums:

```
:0101000019D5
:00000000000
```

Now the program has been assembled, we can go ahead and test it, using CP/M's Dynamic Debugging Tool (DDT). DDT allows us to load programs into memory and execute them one instruction at a time, while examining and changing registers, and so on.

DDT At Work

Figure 1 shows a sample run of DDT and A16.HEX (you'll notice I've called my program ADD.ASM and ADD.HEX). The black marks (yes, those marks like spilled ink) are in fact notes intended to guide you through the session and explain the various DDT commands.

Our addition program (if you can call it that) seems to work, so we can push on to subtraction. Now the 8080 doesn't have a 16-bit subtraction instruction, so we must tackle this differently. Subtraction is done manually, starting at the right and working left, borrowing when appropriate — we can do the same thing here. First we subtract E from L, then we subtract D from H, with a borrow.

Here's the program:

```

;      16-bit subtraction example
org      0100h
s16:     mov      a,l ;use the accumulator
sub      e ;subtract E from L
mov      l,a
mov      a,h
sbb      d ;and D from H with a borrow
mov      h,a ;if one was required for L - E
ret
end
```

FIG 1

```

A>ddt add.hex — STARTS DDT AND LOADS ADD.HEX
DDT VERS 2.0
NEXT PC
0101 0000 — EXAMINE REGISTERS
—x
COZOM0E010 A=00 B=0000 D=0000 H=0000 S=0100 P=0000 JMP D303
—xd — CHANGE PROGRAM COUNTER
P=0000 0100
—xd — CHANGE DE
D=0000 0001
—xh — AND HL
H=0000 0001
—t — TRACE
COZOM0E010 A=00 B=0000 D=0001 H=0001 S=0100 P=0100 DAD D*0101
—t
COZOM0E010 A=00 B=0000 D=0001 H=0002 S=0100 P=0101 DRA M*0102
—xd
P=0102 00100 ← DO IT AGAIN ← OUR ANSWER
—xh
H=0002 0041 (HEX = 65 DECIMAL)
—xd
D=0001 009d (HEX = 157 DECIMAL)
—t
COZOM1E010 A=D3 B=0000 D=009D H=0041 S=0100 P=0100 DAD D*0101
—t
COZOM1E010 A=D3 B=0000 D=009D H=00DE S=0100 P=0101 DRA M*0102
—^C
A>
      ↑ = 222 DEC.

```

FIG. 2.

```

A>ddt sub16.hex
DDT VERS 2.0
NEXT PC
0107 0000
—xd
P=0000 0100
—xh
H=0000 7
—xd
D=0000 4 } 7-4 SHOULD = 3
—t
COZOM0E010 A=00 B=0000 D=0004 H=0007 S=0100 P=0100 MOV A,L*0101
—t
COZOM0E010 A=07 B=0000 D=0004 H=0007 S=0100 P=0101 SUB E*0102
—t
COZOM0E111 A=03 B=0000 D=0004 H=0007 S=0100 P=0102 MOV L,A*0103
—t
COZOM0E111 A=03 B=0000 D=0004 H=0003 S=0100 P=0103 MOV A,H*0104
—t
COZOM0E111 A=00 B=0000 D=0004 H=0003 S=0100 P=0104 SBB D*0105
—t
COZ1M0E111 A=00 B=0000 D=0004 H=0003 S=0100 P=0105 MOV H,A*0106
—t
COZ1M0E111 A=00 B=0000 D=0004 H=0003 S=0100 P=0106 RET *937D
—^C
A>
A>ddt sub16.hex
DDT VERS 2.0
NEXT PC
0107 0000
—xd
P=0000 0100
—xh
H=0000 4
—xd
D=0000 7 } 4-7 SHOULD = -3
—t
COZOM0E010 A=00 B=0000 D=0007 H=0004 S=0100 P=0100 MOV A,L*0101
—t
COZOM0E010 A=04 B=0000 D=0007 H=0004 S=0100 P=0101 SUB E*0102
—t
C1ZOM1E010 A=FD B=0000 D=0007 H=0004 S=0100 P=0102 MOV L,A*0103
—t
C1ZOM1E010 A=FD B=0000 D=0007 H=00FD S=0100 P=0103 MOV A,H*0104
—t
C1ZOM1E010 A=00 B=0000 D=0007 H=00FD S=0100 P=0104 SBB D*0105
—t
C1ZOM1E110 A=FF B=0000 D=0007 H=00FD S=0100 P=0105 MOV H,A*0106
—t
C1ZOM1E110 A=FF B=0000 D=0007 H=FFFF S=0100 P=0106 RET *937D
—^C
A>
A>
      ↑ CORRECT!

```

By assembling this, then using DDT to test it, we can check that it works and see its operation. Take a look at Figure 2. The arrows show the movement of values between the registers.

How does the program cope with negative numbers — fine! In the second part of Figure 2, 4 from 7 leaves FFFD, which is correct, as in two's complement arithmetic FFFD is -3. If you don't believe me, add 1 to FFFD, giving FFFE (= -2), add 1 again giving FFFF (= -1) and add 1 again, giving 0000 (= 0).

Go Forth And...

Multiplication on many computers is basically a matter of repeated addition. For example, 9 by 7 is simply 9 added to itself 7 times.

However, remember the good old days 20, 10 or even two years BC (before calculators) when we used to work out long multiplication problems with paper and pencil? We didn't do it that way at all; instead we did it like this:

367	
x 538	

2936	8 x 367
1101	3 x 367, shifted one place left
1835	5 x 367, shifted two places left

197446	Total of intermediate calculations
=====	

Try one yourself to jog your memory; and take comfort from one L. Bell getting that example wrong the first time (something I wouldn't have noticed without a calculator!).

Notice how the method works. We reduce the problem to single-digit multiplication, which we know how to do from memorized tables. As each successive digit of the multiplier is used to multiply an intermediate result, we shift the answer one more place to the left. Finally, the intermediate results are added up.

Now a binary computer knows how to multiply by a single digit. How? Well, there are only two possible digits, 1 and 0, and 1 times anything is the same thing, while 0 times anything is 0.

Long Multiplication Simplified

Computers are also good at shifting numbers left to right and vice versa; and they can add. Those are all the elements required for a multiplication routine. The only difference between long multiplication on a computer and long multiplication by hand is that with a computer it makes sense to add the intermediate results as they are calculated, rather than waiting until the end of the calculation.

We can write a multiplication algorithm like this:

M1. Set RESULT equal to zero.

M2. Is the leftmost digit of the multiplier a 1? If not, go to step 4.

M3. If yes, then RESULT = RESULT + MULTIPLICAND.

M4. Shift MULTIPLIER one digit right (drops leftmost digit). If MULTIPLIER is now zero, calculation is complete.

M5. Shift MULTIPLICAND one digit left (multiplies it by 2). If MULTIPLICAND is now zero, calculation is complete. Else go to step 2.

This algorithm is fundamentally the same as for long multiplication by hand. In an assembly language version, we will actually build the result in HL, the multiplier will be DE and the multiplicand in BC. In fact to maintain compatibility with our other routines, we will start the routine with the multiplicand in HL; but the first thing the routine does is move HL to BC.

Note, we are multiplying two 16-bit numbers. The result, therefore, could be as large as 32 bits. Why then build the answer in HL, which is a 16-bit register?

The answer is simply that we are performing 16-bit arithmetic and could not use a 32-bit result. Further, we've just run out of registers on the chip, and would have to start fiddling with memory, so the whole thing becomes too complicated. Bear in mind too that multiplication of large numbers could cause overflow, with no error message or other indication.

Routine Notes And Shifts

A few notes about the routine...

The numbers in brackets in the comments refer to the steps of the algorithm above. Note that although the 8080 has two kinds of rotate instruction, we want 16-bit shift routines for this application. Although the routines carry a bit from one byte to the next, they do not carry right around, so they are shifts.

Also keep in mind which instructions affect the carry and zero flags and which do not. Apart from that the routine is reasonably straightforward.

```

org    0100h

;      16-bit multiplication routine
;      Uses:
;      multiplier in DE
;      multiplicand in HL
;      overwrites BC, A and flags
;
;      Returns result in HL

mult:  mov    b,h    ;copy hl to bc
        mov    c,l
        lxi    h,0    ;set hl to 0 (M1)

ml:    mov    a,e    ;is ls bit a 1

```

```

        rrc         ; (M2)
        jnc    m2    ; (M2)
        dad     b     ;if so, add b to result (M3)
m2:    call    sder   ;shift de right (M4)
        rz         ;if de = 0, we're done
        call    sbcl  ;shift bc right (M5)
        rz         ;if bc = 0, we're done
        jmp     m1    ;loop again

;      Shift DE right, setting Z if DE is zero
;      Uses A and flags
sder:   xra     a     ;zero carry flag
        mov     a,d    ;shift left byte first
        rar
        mov     d,a
        mov     a,e    ;then right byte
        rar
        mov     e,a
        ora     d     ;sets Z if D and E zero
        ret

;      Shift BC left, setting Z if BC is zero
;      Uses A and flags
sbcl:   xra     a     ;zero carry flag
        mov     a,c    ;shift right byte first
        ral
        mov     c,a
        mov     a,b    ;then left byte
        ral
        mov     b,a
        ora     c     ;sets Z if C and B zero
        ret

end

```

Assemble the routine and test it on your computer using DDT or a similar debugger/monitor. See what happens when large numbers are multiplied. What about negative numbers?

... And Multiplying By Constants

Multiplication by a constant is generally easier to organise. For example, multiplication by 10 can be done by repeated doubling, plus an addition, as $10 = 2 \times (1 + 2 \times 2)$. Thus a segment of code to multiply HL by 10 would be:

```

multi0: mov     e,l
        mov     d,h
        dad     h     ;double HL (x2)
        dad     h     ;and again (x4)
        dad     d     ;add DE (x5)
        dad     h     ;last time (x10)

```

The method for division is broadly similar to manual long division. It's not just repeated subtractions — the method is a little more sophisticated than that. But in any case, writing a division routine will involve us deeper in the theory of arithmetic than the theory of assembly language, so I don't propose to delve into it here. If there is enough interest we might return to it later.

Next month we'll move on to more general programming techniques: block fill and moves, string searches and so on. □

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Avid birdwatcher LES BELL has sub-titled this issue's rivetting episode of his BASIC tutorial series A Gentle Introduction to Forms Design. In this chapter you'll meet such interesting fauna as terminal functions, user definable functions and the dummy variable (whoever he might be).

Basic for Birdwatchers

Part VII

I'LL BEGIN this month by temporarily diverting your attention from disk files to the point where the whole process starts — with the information being input — and show you how inputting can be made neater and more professional.

To do this we're going to tackle screen handling and user-definable functions.

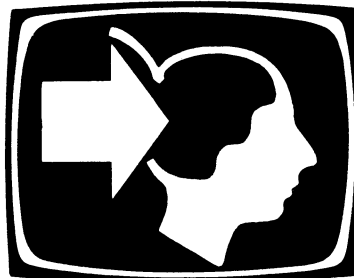
The BASICs in some machines include simple screen-handling functions, in the form of the CLS and PRINT@ statements, so certain parts of this information will not apply to users of TRS-80, System 80 and similar systems. However, some of the other techniques may prove useful.

Inputting data to a computer is like filling in a form — the whole process can be made far more comfortable if the screen is organised to look just like a form. To do this with a standard 'dumb' computer terminal we must output special control codes or escape sequences to the terminal. These codes command it to perform such functions as clear screen, position cursor, and so on.

Different terminals have different sequences of control codes for their functions; that's why a program like WordStar, which makes extensive use of terminal functions, usually comes with an INSTALL program. INSTALL sets up the appropriate codes in the program to make it work on a particular terminal. You can do something similar in your programs by setting up the appropriate codes in string variables and functions at the beginning of a program.

For example, the Lear-Siegler ADM-3A terminal will clear its screen if you send a CHR\$(26). In the case of a Televideo TVI 910, the appropriate character sequence is CHR\$(27) followed by CHR\$(26). For an ADDS Regent terminal, it is CHR\$(12).

your computer



tutorial

Times Getting Tougher Than...

Okay, imagine someone gives you a program written for the ADDS with PRINT CHR\$(12) statements all the way through it, and you own a TVI 910.

You're in luck if you have a text editor with global search and replace function: otherwise, you'll have to go through and find every occurrence of PRINT CHR\$(12) and change it to PRINT CHR\$(27);CHR\$(26). You'll also have to watch out for LPRINT CHR\$(12) statements — they send form feeds to the printer...

Life was meant to be easier than this, wasn't it?

Surely it would have been better if your friend had written at the beginning of the program:

```
10 CLS$ = CHR$(12)
```

and then used PRINT CLS\$ all the way through. All you would have to do to be in business is change line 10 to:

```
10 CLS$ = CHR$(27) + CHR$(26)
```

As a bonus this even works faster,

though you're unlikely to notice the difference.

You can use a similar technique to send cursor home, up, down, left and right commands to any terminal. For example, for the TVI 910:

```
10 HM$ = CHR$(30)
20 CLS$ = CHR$(27) + CHR$(26)
30 UP$ = CHR$(11)
40 DN$ = CHR$(10)
50 LE$ = CHR$(8)
60 RT$ = CHR$(12)
```

Now we're starting to get somewhere! But how about more complex jobs, like moving the cursor to a particular row and column? For the ADM-3A this means sending an escape character, CHR\$(27), followed by an equals sign, then the row number plus an offset of 31 (as a binary number), then the column in the same fashion.

How do we treat this case?

That's where **user-definable functions** come in. In Microsoft BASIC and CBASIC-2 you can define your own functions by using the DEF FN statement. For example, we can define a function which converts Centigrade to Fahrenheit. The formula is $F = 1.8 \times C + 32$ (we used it earlier in a simple program).

To define a function called FNF(C) we write:

```
70 DEF FNF(C) = 1.8 * C + 32
```

In this case, the function is really called F, or FNF (function F) in full. The bracketed C is a **dummy variable**. It bears no relation to the variable C which may be used elsewhere in a program. It simply means the number appearing in brackets when the function is called



should be used as the dummy variable C in the calculation.

Use Of The Dummy

To show the use of this simple function in a program, here's an example:

```
10 DEF FNF(C) = 1.8 * C + 32
20 INPUT "Centigrade";X
30 PRINT "equals";FNF(X);"Fahrenheit"
40 END
```

Note the function must be defined before it is used, and that although in the definition C is used as the dummy variable, when it is called will operate on whatever variable is passed to it.

Now in this example the function returned a real number. However, functions can return other data types too — and function names follow the same rules as variable names. So an integer function could be defined and named FNDO%(X), or a string function named FNHS\$(A\$).

To return to our problem of PRINTING the escape sequence which positions the cursor, here's a possible solution:

```
10 DEF FNGXY$(X,Y)=CHR$(27)+"="
+CHR$(Y+31)+CHR$(X+31)
```

Here we've defined a function GXY\$(gotoXY) which is to be passed two dummy variables X and Y. It then constructs a string consisting of ESCape, =, Y plus offset, X plus offset. On an ADM-3A, then, the line

```
240 PRINT FNGXY$(40,12);
```

will position the cursor near the centre of the screen.

Different functions will be required for other terminals; on a Hazeltine terminal you would use this function:

```
10 DEF FNGXY$(X,Y) = CHR$(27)+CHR$(17)
+CHR$(X+31)+CHR$(Y+31)
```

On the ADDS Regent, it would be

```
10 DEF FNGXY$(X,Y) = CHR$(27)+"Y"
+CHR$(Y+63)+CHR$(X+63)
```

This technique can be used to produce rudimentary computer graphics on serial terminals. Try this short program — after modifying it for your terminal, of course:

```
100 DEF FNGXY$(X,Y)=CHR$(27)+"="
+CHR$(Y+31)+CHR$(X+31)
110 CLS=CHR$(27)+CHR$(26)
120 AS$ = CHR$(27)+CHR$(72)
130 PRINT AS$
140 PRINT CLS$
150 FOR X=1 TO 80
```

66



```
160 FOR Y=1 TO 24
170 PRINT FNGXY$(X,Y);" ";
180 NEXT Y
190 NEXT X
200 PRINT AS$
```

The AS\$ is a string to turn auto-scrolling on and off on the TVI 910. Without it the terminal will automatically scroll up periodically, spoiling the display.

Well It's Round-ish, Sir

To display a circle (of sorts) try this:

```
100 DEF FNGXY$(X,Y)=CHR$(27)+"="
+CHR$(Y+31)+CHR$(X+31)
110 CLS=CHR$(27)+CHR$(26)
120 AS$ = CHR$(27)+CHR$(72)
130 PRINT AS$
140 PRINT CLS$
150 FOR X = -10 TO 10
160 YC1 = 12 + SQR(100 - X ^ 2)
165 YC2 = 12 - SQR(100 - X ^ 2)
170 XC = 60 + X
180 PRINT FNGXY$(XC,YC1);" ";
FNGXY$(XC,YC2);" ";
190 NEXT X
200 PRINT AS$
210 PRINT FNGXY$(1,1);:LIST
```

Many terminals have other functions. On the TVI 910, for example, the strings 'ESC ' and 'ESC (' turn half-intensity on and off. So we can define a function to print a string in half intensity:

```
30 DEF FNHT$(A$)=CHR$(27)+" "+A$
+CHR$(27)+" ("
```

To print a string of underlines:

```
40 DEF FNLN$(L)=STRING$(L,95)
```

Here the STRING\$ function is used to generate a string of length L, composed of underlines (CHR\$(95)). To print a string, but underlined (on the TVI 910):

```
50 DEF FNUL$(A$)=CHR$(27)+"GB"+A$
+CHR$(27)+"G0"
```

Take a look through the manual for your terminal; you will find many functions that can be controlled this way. It's possible to lock and unlock the keyboard, turn a printer on and off, make characters blink or inverse video, and so on.

The most important use of these functions is in the creation of forms for input and formatted output. In the case of our telephone directory, we are dealing with fixed length records, which cannot be exceeded. It would be handy to know how much space is available for a name before we start filling it in. We can do this by printing up a blank form with underlines indicating the space available for data entry.

To take us out this month, here's an example of a short routine which could be used in our telephone directory program.

```
10 DEF FNGXY$(X,Y)=CHR$(27)+"=" +CHR$(Y+31)
+CHR$(X+31)
12 DEF FNHT$(A$)=CHR$(27)+" "+A$
+CHR$(27)+" ("
13 DEF FNLN$(L)=STRING$(L,95)
14 HOME=CHR$(30)
15 CLS=CHR$(27)+CHR$(26)
17 PRINT CLS$
20 PRINT FNGXY$(1,3);FNHT$("Surname : ");
FNLN$(20)
30 PRINT FNHT$("First Name : ");FNLN$(20)
40 PRINT FNHT$("Street : ");FNLN$(30)
50 PRINT FNHT$("Town/City : ");FNLN$(20)
60 PRINT FNHT$("Postcode : ");FNLN$(4)
70 PRINT FNHT$("Telephone : ");FNLN$(15)
75 PRINT FNHT$("Comment : ");FNLN$(19)
80 PRINT FNGXY$(13,3);:INPUT N$
90 PRINT FNGXY$(13,3);" : ";N$;
SPACE$(20-LEN(N$))
100 PRINT FNGXY$(13,4);:INPUT C$
110 PRINT FNGXY$(13,4);" : ";C$;
SPACE$(20-LEN(C$))
120 PRINT FNGXY$(13,5);:INPUT A1$
130 PRINT FNGXY$(13,5);" : ";A1$;
SPACE$(30-LEN(A1$))
140 PRINT FNGXY$(13,6);:INPUT A2$
150 PRINT FNGXY$(13,6);" : ";A2$;
SPACE$(20-LEN(A2$))
160 PRINT FNGXY$(13,7);:INPUT PC$
170 PRINT FNGXY$(13,7);" : ";PC$;SPACE$(16)
180 PRINT FNGXY$(13,8);:INPUT TEL$
190 PRINT FNGXY$(13,8);" : ";TEL$;
SPACE$(15-LEN(TEL$))
200 PRINT FNGXY$(13,9);:INPUT CT$
210 PRINT FNGXY$(13,9);" : ";CT$;
SPACE$(19-LEN(CT$))
```



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Care for Computers

With personal computers starting to appear in the office, we've been besieged with thousands of requests from one or two people: How do I look after my computer? LES BELL reports on preventative maintenance for the micro.

MOST people's idea of maintaining office equipment consists of: first, blowing some of the paper dust out of their typewriter; second, unjamming the photocopier; and third, ringing the repair man if anything more complex goes wrong.

Preventative maintenance consists of not spilling your coffee into the adding machine.

The introduction of computers into this scenario sounds like a recipe for disaster, but it needn't be. The enemies of small computers are fairly well known. They're mainly the kind of things which make you feel uncomfortable yourself — heat, dust, and the like. So here are the best ways to deal with the dangers, beginning with heat.

Like most pieces of electronic equip-

ment, computers run into problems if they get too hot. The life expectancy of a semiconductor device halves with every few degrees of temperature increase, so not keeping a computer cool is simply inviting trouble. Keep the computer in an air-conditioned room and the result will be vastly improved reliability.

If air-conditioning is not possible, then at least use a cooling fan in the area of the equipment. Larger systems should have a cooling fan built in, to circulate air over the components.

Some small systems such as Apples are sometimes fully expanded with multiple cards, to the extent that they are operating well above their design temperature. In this case, the addition of a small 'Muffin' fan will greatly improve the situation.

Dust In The Works

Site your computer in as clean an environment as possible, and preferably away from dust-traps such as bookshelves and baroque-style furniture. In particular, even though your computer may be responsible for inventory control, *don't* put it in the

main warehouse area which is full of dust.

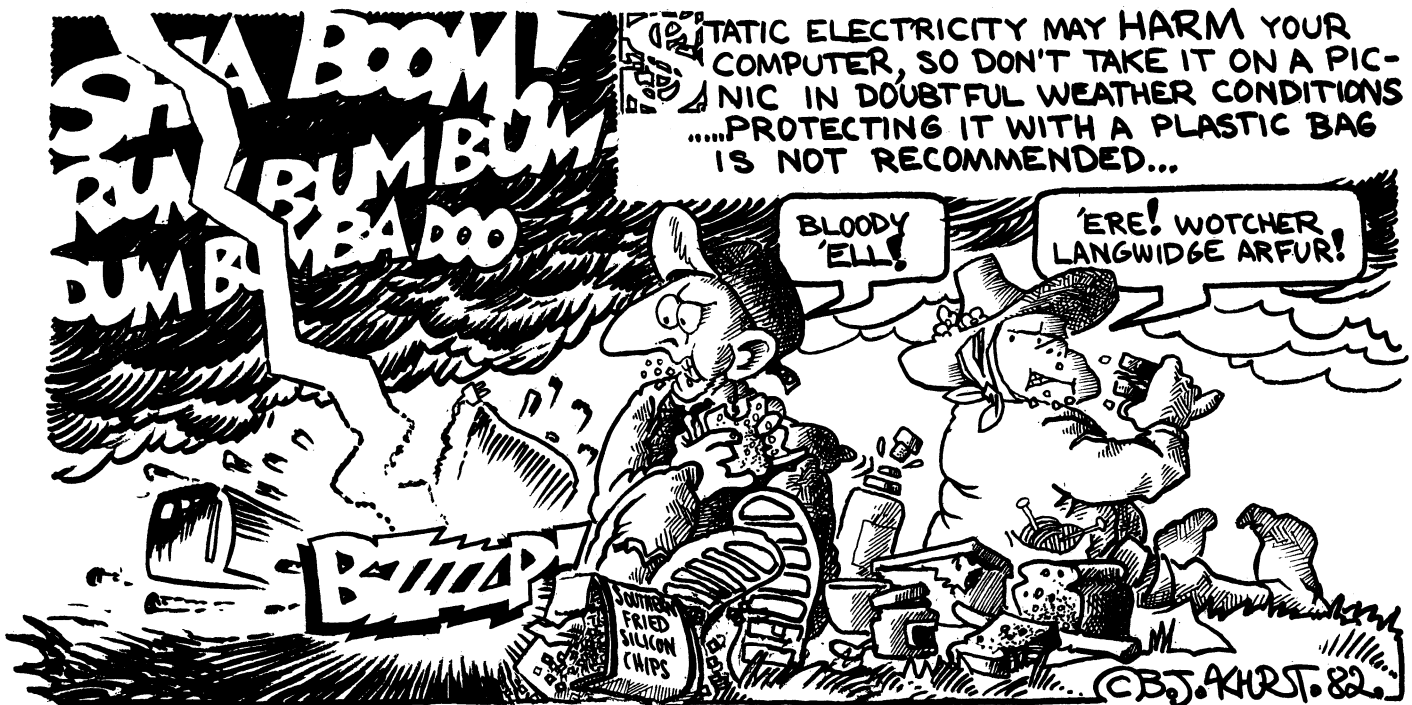
If dust is likely to be a problem, then any cooling fans in the equipment should be fitted with filters and equipment covers should be put in place when the equipment is not in use.

Dust is an anathema to disk drives, which are predominantly mechanical devices full of high-precision, high-speed moving parts. The surfaces of floppy diskettes are also prone to damage by dust particles. Diskettes should be kept in their jackets when not in use and stored in proper library boxes.

Floppy disks can also warp like records. Temperature extremes can make them expand and contract, losing their tolerances and causing errors. The answer again is constant temperature air conditioning.

Floppies should not be written on, as ballpoint pen pressure will be transmitted through the cover to the disk inside. Likewise, they should not be bent, stapled (heaven forbid), or paper-clipped to other documents.

Some suppliers produce a card which shows the no-nos for handling floppies.



Stick it up on the wall beside your computer.

Keep back-up copies of all disks. When your computer is new and everything is perfectly aligned and working at peak, it's easy to get over-confident about this. But one day...

I've also banned smoking in the immediate vicinity of my computer. It's very convenient, as people who don't mind offending others with their cigarette smoke seem to consider the feelings of the machine much more important. Strange.

Static — Mind The Carpet!

Static electricity is less of a problem in Australia than it is in colder climates. Many of the MOS (metal oxide semiconductor) circuits inside a computer are particularly susceptible to damage by static, particularly if they are removed from the computer. While everything is wired up and working, there's usually no problem. But if you disconnect, say, a disk controller cable, the risk of damage increases.

Static is generated by dry surfaces rubbing together. The worst culprits in offices are certain types of nylon carpets, combined with some rubber-soled shoes. Nylon underclothes have also been identified as troublesome (*now don't be silly — you know what we mean*). The answer is generally to choose your carpet with care or, if you're stuck with it, to experiment with your shoes and only wear those which don't generate static.

It may also be an idea to restrict access to the computer to those staff who know the requirements re static and clothing.

Another solution is to place conductive mats under the computer, thereby ground the computer and operator, and eliminating the static.

Power Line Problems

Other maladies that can affect the small computer are power line glitches. These take a variety of forms, from interference signals, through over-voltage spikes, to brown-outs or blackouts.

How can these be fixed?

Interference signals and spikes can generally be fixed by a line conditioner circuit (supplied by any electrician). This will filter out the interference and flatten out the spikes. End of problem.

Brown-outs aren't so easy. They happen when, for example, a large motor is on the same power circuit as your computer. Then, when the motor is switched on, it draws a high current, thus depriving the computer of much-needed voltage. Some computers don't mind momentary brown-outs — they have large reservoir capacitors which keep on supplying the computer in the meantime.

Computers with switched-mode power supplies (the Apple again, in particular) don't have these capacitors, so momentary interruptions cause problems. The answer is to add the capacitors inside the computer. Talk to your service guy about it.

Connect your computer to a circuit of its own, if possible, and as near to the main fuseboard as possible. That will help a little.

Blackouts? Well, there's not much you can do about them. Uninterruptible power

supplies are available, but they're expensive, and you'd still have to work in the dark.

Maintenance Contracts

Maintenance contracts are usually a good idea for small business computers. Costs will vary from \$400 a year up to \$3000 or more.

Now before you say, "Hell, I can buy a new computer for that", just stop and think. What's important here is not the value of the computer, but the value of what your computer does. If all your invoicing is done by the computer, even a week's disruption can have serious effects on your cash flow.

Service contracts come in several flavours. They can cover the whole system, or just parts of it. You can have round-the-clock, top-priority service, 'fix-it-in-a-day' service, or 'we'll-do-our-best' service.

In addition, look for the following points in a service contract: can you obtain a 'loaner' machine while yours is in the service shop? Can you obtain a replacement for an 'unfixable' machine (yes, they do exist — but more often it's an 'unfixable' technician that's the problem). How about preventive maintenance checks (disk head cleaning, and such)?

If you're trying to cut corners on a maintenance contract (not good, but we don't live in a perfect world), then I'd be inclined to cover the electro-mechanical parts such as the disk drives and printer in preference to the purely electronic parts in the processor itself. In many cases, these can be 'fixed' by a simple board replacement.



Beyond Neptune & Terrigal Personal

Linton-Simpkins

I DON'T know anyone who believes in the horoscopes printed in newspapers; nor do I know anyone who fails to read them to check what's in store for them.

Yet perhaps we have all been had, because it seems likely there is yet another planet in the universe; we may not be getting all the astral data to our modern astrologers, and thus they may be in error.

After all it's only since 1930, a mere 52 years ago, that we have known about Pluto. Think how little Pluto has been screwing up astrology charts for thousands of years without anyone being the wiser?

After 52 years there are signs that there could be a massive tenth planet way out past Pluto (more than 5.92 billion kilometres out from the sun) or a minor planet somewhere between Pluto and Neptune.

The reason such diverse locations and sizes are the best estimates which can be given is that no one has seen the planet postulated. Its possible locations have been determined by computer calculations on why Uranus and Neptune are perturbed in their predicted orbits.

It is easier to postulate that there may be a planet in either of the two orbits than to either say exactly where it is, or even to suggest target regions for optical searches to verify the postulation.

The Uncertainty Principle

One recalls that excellent kiddies' book, *The Space Child's Mothergoose*; and the fragment that is all I remember of it: *Possible, probable, my black hen, She lays eggs in the relative when. She doesn't lay eggs in the positive now, Because she's unable to postulate how.*

To some extent the uncertainty principle applies to seeking out new planets. Even if we were able to have our computer calculate a detailed and exact orbit we could not be sure exactly where on that orbit the planet might be at the time we are observing.

Thus, on a planet which is trans-Plutonian, we have an enormous area of the sky to search, so might go on missing it for years.

If it is a massive planet out past Pluto,

then it will be almost non-reflective and very likely not visible unless we use large telescopes and image-enhancing computer routines.

On the other hand, if it is a minor planet inside the orbit of Pluto but outside that of Neptune, the same visibility problem occurs even if the orbit would, of necessity, be shorter. Pluto's year is over 900 Earth years. That of a trans-Plutonian planet correspondingly larger.

There is such a minor planet or larger orbiting object between Uranus and Saturn (called Chiron, after the ferryman who took the souls of the dead to hades in ancient mythology); it is now fairly easy to find as its orbital data is extensive.

But the problem of locating that possible extra planet is compounded because the perturbations in the orbits of the outer planets may have other causes, the mechanisms of which we don't understand. There is a classical example from last century when astronomers calculated from apparent perturbations in the orbit of Mercury that there was another planet closer in to the Sun. It was even named (Vulcan), but the perturbations were explained by — in fact provided a major experimental proof of — Einsteinian theory.

Nevertheless the computer prediction based on orbital perturbations shown by the two outer planets may yet yield the existence and location of the tenth planet of the solar system.

Computers And Radio Telescopes

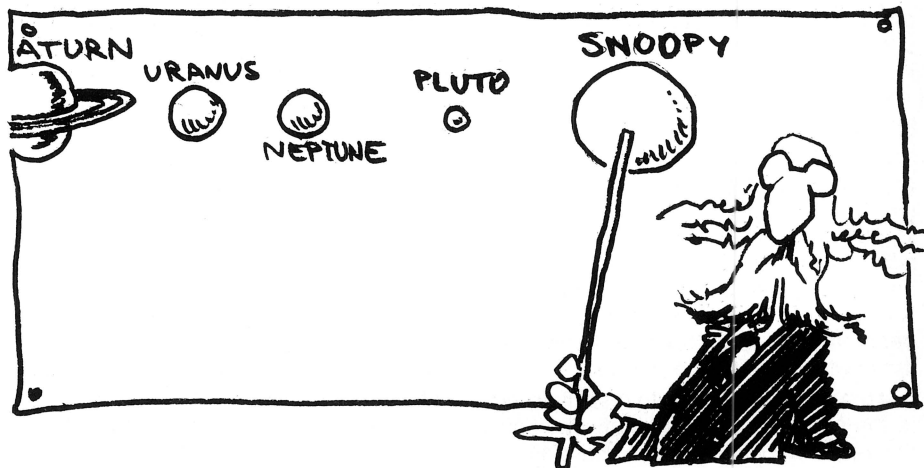
If the computer wasn't available the calculations to determine the supposed location of this supposed planet or even to postulate its existence at all, would either still be in progress or be impossible.

Despite the damage another planet might do to astrologers, I hope the computer was right. If there are more planets, they will be fearfully cold and a hell of a long way away, but it will make me feel good to know they are there.

Computers have played an enormous part in astronomy, and even astrology if you believe ads in the popular press, since their invention around 30 years ago. Not the least was the location of radio astronomy sources associated with visible objects.

Physics being what it is (totally bloody-minded), radio sources in the stars cannot be easily associated with visible objects as the radio telescopes we can build cannot resolve things very narrowly.

What some smart Australians did was to use the moon and a computer to identify radio sources which matched visible objects by noting what time the radio source was blanked out by the moon. The distance to the moon and its orbit is known to within a metre or so. From this data, plus the time when the moon occulted the radio source, the astronomers were able to positively identify a visual object with its radio source.



This has proved to be very handy when studying immensely distant objects like Quasars.

This, incidentally, isn't a small Japanese car but a quasi-stellar light source — an object that looks about the size of a star but emits energy at the same rate as a whole galaxy.

Terrigal Personal

THE FAMILY mobile energy crisis having consumed its rations for the week, and the refinery workers of NSW having combined to lose their chance, and my chance of actually driving to Terrigal at the command of my masters, I found myself entering Sydney's railway station, Central, with a view to attaining Gosford, roughly 90 km and more or less north.

Despite the prospect of two lots of public transport I was jaunty of step until I saw the sign which warned that the new phoney marble footing was very slippery when wet. It isn't too safe when dry either, let me tell you. But after righting myself I joined my train with undiminished confidence.

As I settled into my seat, top deck, on the left-hand side, facing where the engine ought to be on any civilised train, I tried to recall how many times I had been to the annual ACS (Australian Computer Society) Ingathering at Terrigal. I lost count.

First, though not in chronological order, was the one where the man who had had a vasectomy specially for Terrigal but couldn't get anyone to believe him and left to flee the country. Then there was the

one at which David Tennant of CND won the Bradman award at the golf. And there is the one at which a party sailed all the way from Sydney and had to turn back 200 metres from Terrigal because of the storm.

Others who spring to mind include the one at which an American won all the money from the poker players by Saturday lunch time and the first one at which someone discovered where the illegal casino was at Gosford.

I even spoke at one Terrigal gathering and because I came on right after the opening address, I had a large audience. Since I didn't turn off the lights to show slides, no-one could escape until I'd finished.

I think it was that same Terrigal which one delegate tried to run me down with his car on Saturday, because he didn't like what I had written about something or anything. Ah, the joys of Terrigal and one's youth.

It all began to come back to me as I waited for the train to go. I had arrived early to catch another train, but somehow I hadn't been told I needed to book and had to wait. I wasn't alone in the booking mix-up. Mr Adrien Lambert had the same trouble, I discovered later.

A Chance Meeting

There I was alone, my best profile, on the top deck of one of our nice interurban trains when I saw a man come up the stairs and walk towards me. I pretended sleep.

Coming towards me, he shook me awake and asked me if the seat alongside

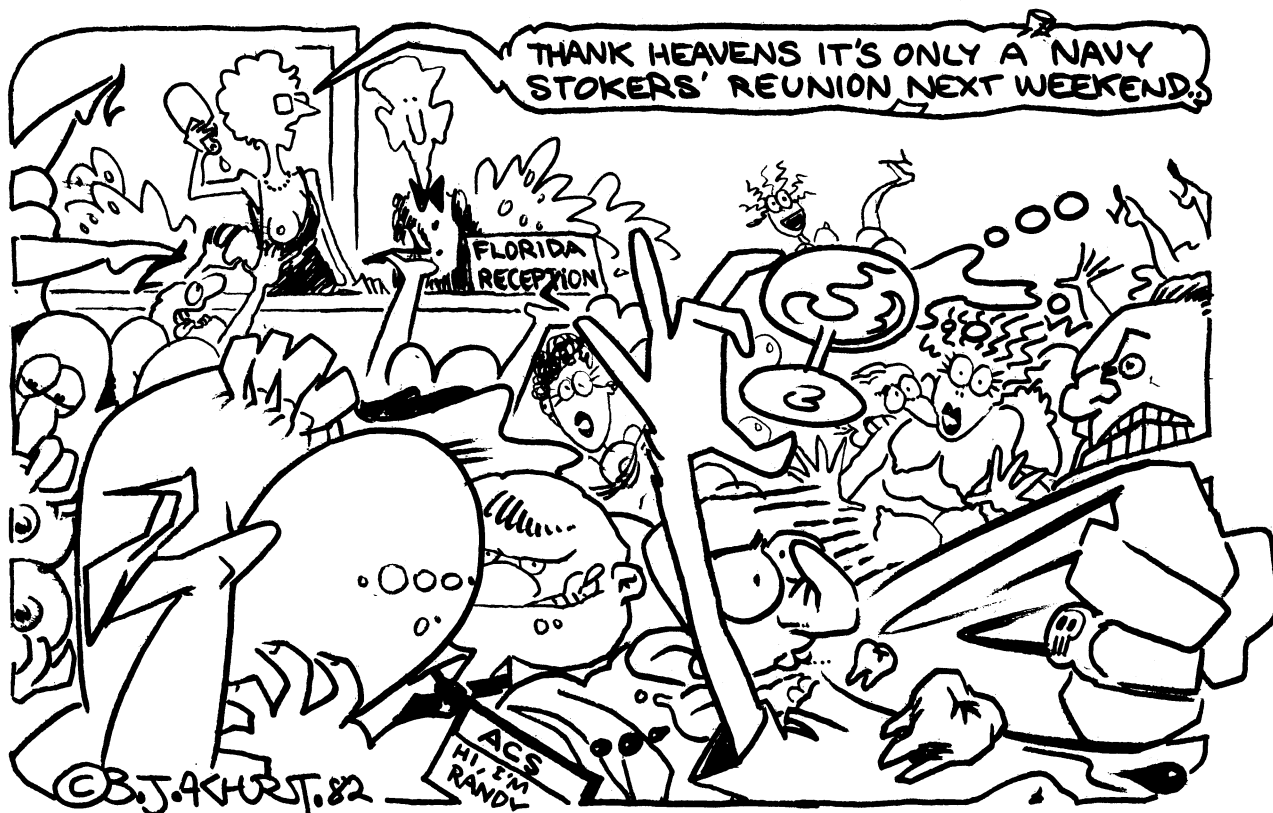
me was taken. I said yes, in Greek. He sat down and shook me awake again to declaim that it was a great day. I said the only Gaelic swearwords my sainted grandmother taught me, something to the tune that he was the result of an illicit and loveless union between an itinerate English warrant officer and a diseased donkey abandoned by a Tinker.

He shook me awake again to accuse me of not being an Australian. It was then I saw the RSL badge and said in my best broken English that I was a Russian ballet dancer. He went off down the corridor swearing to call the guard and have me thrown off "a whiteman's train". Ah, the peace that comes with a job well done.

Once we were under way things improved. Within about 90 minutes of leaving Central Station we were pulling up at Gosford and I was getting out into the heat and flies. The RSL man came up with a guard, who he told I was a Russian spy.

The guard and I discussed this point at some length and finally decided the RSL man was wrong. Then we three delegates, who could not be accused of spying but merely madness, waited in the sub-tropical heat until the bus arrived, then it was off to the coast and Terrigal.

About halfway out to the coast the country suddenly changes from depressed semi-rural industrial to the sort of environment John Wyndham called the 'Fringes' in *The Chrysalids*. Here dwelleth strange beasts and monsters most horrible could be what they wrote on the map about this country in the 16th Century.



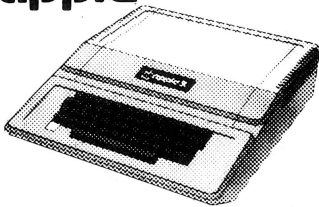
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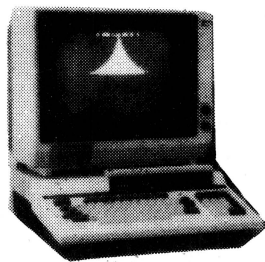
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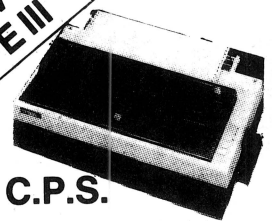
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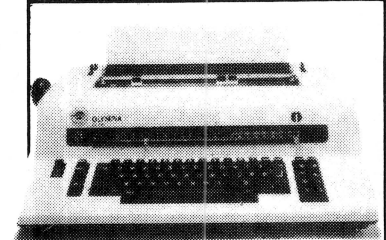
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After a few kilometres of the Fringes the road passes a lake on the left, and then one is in Terrigal and the central registration place, the Florida Hotel. American names are very popular around the area. One bus was going, I swear it, to Wyoming via Maidens Bush. There is also a Saratoga nearby.

High Ideas And Stakes

Once at the Florida and signed in, the delegates were assigned their rooms. Some were in the hotel itself and some near the Queensland Border, if one accepted their description without question. After all this the business of the conference could commence, and what is more, it did.

Much of the real action of the show takes place around the pool, in the sauna, in the bar just off the lobby and in various bedrooms and suites, as the delegates decide their attitudes to various computing matters (the line umpire disqualifies 'Terrigals').

The district has long been a favourite place of retreat and retirement for the wealthier landed gentiles of the north and north-west of NSW, and gambling is a way of life. I have seen a poker hand, not a kilometre from the Florida Hotel, on which more than 20,000 pounds, not dollars, was to change hands.

This spirit inspires the delegates and they often take risks at Terrigal they wouldn't back in Sydney. This doesn't always involve money. But for 1981 Terrigal, I would not be around to see or write about any of these sorts of activities — I had to get the five o'clock train out of Gosford.

If you have never been to Terrigal, then you may want to know the layout. The Florida faces east across the main street to the sea. The main street is used nightly for informal Grand Prix between the multi-hued cars of the local bloods.

People You'll Meet

The entry to the hotel and ACS registration desk is in the centre of the front of the hotel. As you go in turn to your left until you see Graham Neal. He spends nearly the whole weekend in the registration area. If you don't see him, see Derrick Davey, and let them be your guides.

Just past those two you will see a bar. It has no mineral water but does serve wine by the glass and used to make excellent Rusty Nails. From the bar you can see the pool and barbecue area and also the sauna. I think the sauna is now unisex, but after the cardiologist's talk you may like to make up your own minds...

Returning to the lobby you will see the lift and the stairs. Most of the formal activities at the conference take place of the second floor and at the northern end. Press-on and don't despair, there really is a hall there.

Right down at the southern end of the building, but on the top floor, is where the chairman usually stays in a small suite, to which he or she invites a select multitude for a cocktail party and informal sauna sometime during the weekend. Much activity goes on at this party and an exchange of grievous bodily harm either in the outside corridor or on the beach during or after this party has not been unknown in the past. But not this year, no never.

From all this it might be said I had forgotten the real reason for the conference. Actually, I have been spelling out in my own weird way the true reason why it exists: for computer people to have some time away by themselves without fear of meeting any civilians.

The reason organisations send people, and the main reason the women come, is so they may hear the papers and learn something.

If all that is true, why have I been to so many Terrigals? That's what I asked myself as I boarded the train at Gosford. It is simply like having a hole in your tooth — you can't stop digging at it with your tongue. It fascinates me and I can't keep away. □

Last year one
Australian
company intro-
duced 209
software prog-
rammes to
Apple personal
computer users
and we bet
you don't even
know our
name?

Adventure in Time

by John Annable

your computer SOFTWARE REVIEW

FOR THOSE who need a gentle push to put their grey matter to work, a lack of locally-available software for Sinclair's ZX computers may be a positive factor.

However, it can be slightly frustrating for those having acquaintances whose cupboards bulge with adventure-type programs. So it was with interest that I learned of Gloster Software's *Adventure in Time*, an Australian-based adventure game with 60K of programs on two cassettes.

I was slightly put off by the price, (\$29.50) but as a good adventure can last for months (this is my third year at Colossal Caves), I bought the package and calmly assured my wife she would gain as much pleasure as I from it (*Great line that, John — Ed.*).

I was a little dismayed too at the packaging — Tandy cassettes with handwritten labels. But on to the contents. . .

The scenario is well thought out. None of your monsters, wizards or castles bulging with treasure here; just home-grown fun with a nuclear rubbish dump buried under a dam. The dump is ready to go off in a few days. . .

The first program is mainly reading, while the scenario is sketched out for you. As a personal touch, before you can do anything you must enter your name, address and local details so they appear throughout the game.

There is a major decision to be made at the end of this section — namely, where do you want the time machine erected?

There are some interesting results if you choose the wrong spot (time travelling is a lot more involved than I realised).

Section two involves a visit to the members of ICONS (International Committee of Nuclear Safety), who are safely ensconced at the Australian base in the Antarctic.

Meeting The Committee

There are six members of this committee: A politician, a philosopher, a time engineer, an anthropologist, a radio astronomer and a nuclear scientist. You have to ask them questions to find vital information which will help you in your quest to save the world.

Having acquired all this knowledge (although from the first few committee members you'll get none of it!) you enter your time machine and zoom off into either the past or future.

In the future you'll find, of course, that the world has already suffered the nuclear calamity and is waiting eagerly with the goodies to help you avert it. In the past you'll find (after a number of unsuccessful attempts) the tribe of aboriginals who inhabit a cave complex near what will be the disposal site in the future (or is it the present?)

An interesting touch here is the use of

path-finding symbols. As you come to each intersection you are given the chance to make a mark on the wall so you can find your way again. During the final section of the game you encounter these marks once again, but find they have aged during the intervening centuries.

The game is very well put together. The unique data transfer system works very well. All of your vital statistics are tucked away at the top of the RAM and subsequently reappear in later programs; loading doesn't erase them.

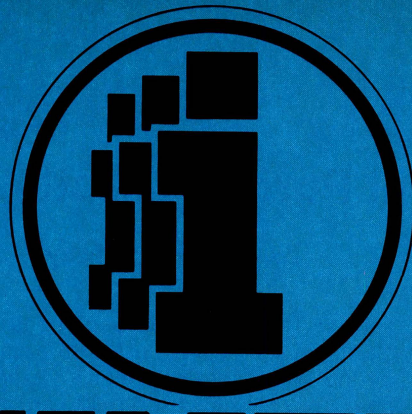
Constant Loading A Hassle

The only hassle I found is the constant loading of programs to reach the stage you were at last time. There is no real short cut because of all the caves and passwords, and many of the locations are random, so you have to find out the information each time. For this reason I imagine you could go on playing the game well after you have solved the puzzle. Different levels of play give you a longer or shorter time limit.

What impressed me about *Adventure in Time* is it seems to offer more ways to die than the usual adventure! There is none of your crude being eaten by a bear or knifed by an errant dwarf. In this adventure you can be speared by aboriginals, buried alive, stranded in another time zone, lost in space, or the greatest kick of all — blown to pieces as the device supra-conflagrates right under your nose. . . good stuff! □

Games Software Report Card

Program:	Adventure in Time			
Made By:	Gloster Software			
Available for:	ZX81/8K ZX80			
Ratings:	excellent	good	okay	well, maybe
Ease of Use		✓		
Speed			✓	
Entertainment value	✓			
Educational value		✓		
Documentation		✓		
Value-for-money		✓		
Holds interest for	A long time if you are successful. However, having been killed it is difficult to face all the program loading again.			
Price:	\$29.50			



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Great Plot, Clever Program

A General Purpose Plotting Program

by Dr David Hollway*

A PICTURE may or may not be worth a thousand words, but often a graphical plot of computer output is worth much more than a thousand lines of multi-column printout.

Changes and trends are more visible and can be interpolated or extrapolated by eye more easily from a plot than from figures — particularly when the exponents keep jumping about.

Not long ago, incremental plotters were far too expensive for use by most micro enthusiasts, while even a 'poor man's plotter' consisting of an X-Y recorder and two D/A converters would not be considered unless the recorder was needed for other purposes. Today, excellent plotters can be obtained within the price range of other microcomputer peripherals, even though they include microprocessors which make them easier than ever before to interface and program.

For research or engineering calculations, graphs provide a useful and compact means of storing both final and intermediate results. However, you can soon tire of writing separate plotting routines for each program, despite the simple repertoire of powerful instructions provided by the designers of the plotters.

I decided, therefore, to write a general-purpose program which could be used as a subroutine or CHAINED with other programs. When friends expressed interest in this, the following listing and description of its operation were prepared: these may prove useful to others.

In planning a general purpose program, decisions must be made as to how much of the operation is to be automatic and how much controlled by the operator. After trials, the program was written in the form of 11 OPTIONS which can be called by the operator in any order. These draw axes, add major and minor scale markings and number the major marks on both axes automatically. Each one of a specified number of variables may be plotted on the same, separate, graphs and repeated after changes to the X or Y scales. Single points may be plotted during computation.

In describing how the program is used, I have included the changes which may be needed to adapt it to different systems. To assist those who wish to make changes, the key variables are defined in a later

section. The program (Listing 2) was written for a Digi-Plot, Model WX4671, made by the Watanabe Instruments Corporation Tokyo, and used with an AED (Sydney) S100 computer using CP/M and Microsoft BASIC 80, Version 5.0, on disk.

How to Use the Program

I have assumed the user has a program which will compute values of Y as a function of X, or perhaps several different functions: Y1, Y2... and so on, for the same values of X.

Listing 1 simulates a typical user's program. To use the plotting program include instructions similar to those in Listing 1, 130 — 170, early in the main program. This sets the number of variables (JMAX), the number of Values of X, (IMAX) and dimensions two arrays: XX(IMAX) and YY(IMAX,JMAX). Also include instructions which store values of X and Y (or Y's)

in these arrays as the calculation proceeds, as well as the CHAIN statement 210.

When calculations are complete, the plotting program (Listing 2) will be read in and the 11 OPTIONS (8005-8045) will be displayed, identified by the numbers <1> to <11>. Throughout this program, characters which must be entered from the keyboard are shown enclosed by inequalities <>.

If only a simple plot is needed, without axes, OPTION <4> should be chosen by typing 4, followed by a carriage return. The program then checks whether the data needed for plotting has been entered, finds it has not, and for the X and Y axes in turn asks whether the scale is linear or logarithmic, the number of units per mm and the starting and finishing points (in units).

If the scale is linear, it asks for the number of units between minor divisions and between major divisions, which will

Listing 1. A simple example to illustrate the use of the plotting program given in Listing 2. Listing 1 was used to draw Figure 2.

```
100 REM== PLOTTEST.BAS == (TO TEST PLOTTER.BAS, LISTING 2) ==
110 REM = WHEN USING PLOTTER.BAS INCLUDE INSTRUCTIONS
120 REM = SIMILAR TO NOS: 130-170, 210 & 220.
130 COMMON PROG$,RETADD,XX(),YY(),IMAX,JMAX
140 RETADD=220 : PROG$="PLOTTEST.BAS"
150 REM = PLOTTER.BAS WILL RETURN CONTROL TO: RETADD IN PROGRAM: PROG$
160 INPUT "NO. OF VARIABLES=";JMAX : INPUT "NO. OF VALUES=";IMAX
170 DIM XX(IMAX),YY(IMAX,JMAX)
180 REM==EXAMPLE:-
190 DTR=180/3.14159 : FOR J=1 TO JMAX : FOR I=1 TO IMAX : XX(I)=I
200 YY(I,J)=SIN(I*J/DTR) : NEXT I : NEXT J
210 CHAIN "PLOTTER.BAS" : REM NOW BEGIN PLOTTING.
220 STOP : REM THIS IS RETURN ADDRESS (RETADD)
```

Listing 2. PLOTTER.BAS A general purpose plotting program.

```
8000 DTR=57.296:REM==PLOTTER.BAS==TO DRAW OR NUMBER AXES OR TO PLOT
8005 EDG%=1:LPRINT CHR$(27);"C":PRINT "====FOR OPTION <1>, TYPE: N CR"
8010 PRINT "DRAW X & Y AXES: 2-SIDES.....<1>, 4-SIDES..<2>"
8015 PRINT "REPEAT X & Y AXES.....<3>"
8020 PRINT "PLOT A VARIABLE.....<4>"
8025 PRINT "MOVE PEN OR WRITE ON PLOT.....<5>"
8030 PRINT "DRAW LINES PARALLEL WITH THE X-<6> OR Y-<7> AXIS"
8035 PRINT "DRAW 'GRAPH PAPER' GRID.....<8>"
8040 PRINT "EDGE LIMIT OFF.(DEFAULT-ON-)..<9>"
8043 PRINT "SOLID(DEF)/BROKEN LINE TOGGLE.<10>" : DD%(0)=0 : DD%(1)=0
8045 PRINT "RETURN TO MAIN PROGRAM.....<11>" : INPUT OPT
8050 ON OPT GOTO 8065,8065,8143,8440,8550,8620,8620,8143,8060,8053,8055
8053 BRO%=1-BRO% : GOTO 8000
8055 LPRINT CHR$(27);"P" : CHAIN PROG$,RETADD
8060 INPUT "REMOVE<0>, RESTORE<1> EDGE LIMIT";EDG% : GOTO 8000
8065 BOX=OPT : GOSUB 8070 : GOTO 8145 : REM==<1><2>INPUT DATA==
8070 FOR XY%=0 TO 1 : IF XY%=0 THEN PRINT "X-SCALE" ELSE PRINT "Y-SCALE"
8075 INPUT "LINEAR<1> OR LOG.<2>";LIG(XY%)
8080 IF LIG(XY%)=1 THEN INPUT "UNITS PER MM";UPMM(XY%) : GOTO 8090
```

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```

8085 LTN=LOG(10):INPUT "MM PER DECADE";UPMM(XY%):REM LATER = 1/UPMM(XY%)
8090 INPUT "BEGIN SCALE AT ? UNITS";BS(XY%)
8095 INPUT "END SCALE AT ? UNITS";ES(XY%)
8100 IF LIG(XY%)=2 THEN GOTO 8115
8105 INPUT "MARK EVERY ? UNITS";MEV(XY%)
8110 INPUT "NUMBER EVERY ? UNITS";NEV(XY%) : GOTO 8120
8115 IF SGN(BS(XY%))<>SGN(ES(XY%)) THEN PRINT "ILLEGAL LOG.SCALE"
8120 NEXT XY%:INPUT "IS DATA OK?, <Y> <NO>";S$:IF S$="NO" THEN GOTO 8070
8125 FOR XY%=0 TO 1:IF LIG(XY%)=2 THEN UPMM(XY%)=1/UPMM(XY%):GOTO 8135
8130 SCL(XY%)=(ES(XY%)-BS(XY%))/UPMM(XY%) : GOTO 8140
8135 LTM(XY%)=LTN*UPMM(XY%) : SCL(XY%)=LOG(ES(XY%)/BS(XY%))/LTM(XY%)
8140 SCL(XY%)=SCL(XY%)+.00001 : NEXT XY% : RETURN
8143 IF BOX=0 THEN BOX=2
8145 IF LIG(0)*LIG(1)=0 THEN GOSUB 8070 : REM==AXES & LINES==
8150 OAX=BOX : IF OPT<>8 THEN GOTO 8160
8155 INPUT "COARSE <1> OR FINE <5> GRID";CFG : OAX=1:BOX=1
8160 FOR XY%=0 TO 1 : FST=0 : MM(0)=0 : MM(1)=0 : OAX=BOX : GOTO 8170
8165 FST=0 : OAX=1 : MM(XY%)=0 : MM(1-XY%)=SCL(1-XY%)
8170 NR%=0 : IF LIG(XY%)=2 THEN GOTO 8215
8175 FOR VV=BS(XY%) TO ES(XY%) STEP MEV(XY%)*.999999 : REM==LINEAR AXIS==
8180 MM(XY%)=(VV-BS(XY%))/UPMM(XY%)
8185 DD%(1-XY%)=7 : II=VV/NEV(XY%)
8190 IF ABS(10*II-CINT(10*II))<.0001 THEN DD%(1-XY%)=12
8195 IF ABS(2*II-CINT(2*II))<.0001 THEN DD%(1-XY%)=25
8200 IF ABS(II-CINT(II))<.0001 THEN DD%(1-XY%)=40
8205 IF OPT=8 THEN GOTO 8320
8210 GOSUB 8410 : NEXT VV : ON OAX GOTO 8335,8165
8215 BSS=ABS(BS(XY%)) : SIT=10:(INT(LOG(BSS)/LTN)) : SIT=SIT*SGN(BS(XY%))
8220 NR%=0 : RESTORE 8225
8225 DATA 5,20,10,10,20,5,50,2,100,1
8230 MM(XY%)=0 : DD%(1-XY%)=50 : FST=0 : GOSUB 8410
8235 RESTORE 8225 : VV%=100 : REM NEW DECADE.
8240 READ DVV%,NV%
8245 IF DVV%=100 THEN GOTO 8255
8250 IF LOG(1+DVV%/VV%)/LTM(XY%)<2 THEN GOTO 8240
8255 FOR N%=1 TO NV% : VV%=VV%+DVV%
8260 MM(XY%)=(LOG(VV%*SIT/BS(XY%))/LTN-2+NR%)/UPMM(XY%)
8265 IF MM(XY%)<0 THEN GOTO 8310
8270 IF MM(XY%)>SCL(XY%) THEN ON OAX GOTO 8335,8165
8275 DD%(1-XY%)=5 : IF VV%/10=INT(VV%/10) THEN DD%(1-XY%)=9
8280 IF VV%/50=INT(VV%/50) THEN DD%(1-XY%)=16
8285 IF VV%/100=INT(VV%/100) THEN DD%(1-XY%)=25
8290 IF VV%/500=INT(VV%/500) THEN DD%(1-XY%)=40
8295 IF VV%/1000=INT(VV%/1000) THEN DD%(1-XY%)=50
8300 IF OPT=8 THEN GOTO 8320
8305 GOSUB 8410
8310 NEXT N% : IF VV%<1000 THEN GOTO 8245 : REM NEW LOOP
8315 NR%=NR%+1 : RESTORE 8225 : VV%=100 : GOTO 8235 : REM NEW DECADE
8320 OAX=1 : IF DD%(1-XY%)<CFG THEN GOTO 8330
8325 GOSUB 8410 : DD%(1-XY%)=0 : MM(1-XY%)=SCL(1-XY%) : GOSUB 8410 : FST=0
8330 MM(1-XY%)=0 : ON LIG(XY%) GOTO 8210,8305
8335 NEXT XY% : REM==NUMBER THE SCALES==
8340 LPRINT "S"; 2 : FOR XY%=0 TO 1
8345 LPRINT "Q";XY% : IF XY%=0 THEN DV=8 ELSE DV=6
8350 MM(1-XY%)=-8+XY%*2 : IF LIG(XY%)=2 THEN GOTO 8380
8355 FOR VV=BS(XY%) TO ES(XY%) STEP MEV(XY%)*.999999
8360 II=VV/NEV(XY%) : IF ABS(II-CINT(II))>.0001 THEN GOTO 8375
8365 MM(XY%)=(VV-BS(XY%))/UPMM(XY%)-4 : FST=0 : GOSUB 8410
8370 LPRINT "P";CINT(VV/MEV(XY%))*MEV(XY%)
8375 NEXT VV : GOTO 8405
8380 SCD=-20 : FOR VV=LOG(SIT/BS(XY%))/LTN TO SCL(XY%)*UPMM(XY%)
8385 MM(XY%)=VV/UPMM(XY%)-6 : MM(1-XY%)=-8 : IF MM(XY%)=SCD THEN GOTO 8400
8390 IF MM(XY%)<-6.00001 THEN GOTO 8400
8395 FST=0 : GOSUB 8410 : LPRINT "P";BS(XY%)*10+VV : SCD=MM(XY%)
8400 NEXT VV
8405 NEXT XY% : LPRINT "Q";0 : LPRINT "H" : GOTO 8000
8410 IF FST=0 THEN X$="M" ELSE X$="D" : REM==MOVE PEN OR DRAW==
8415 XU%=MM(0)*10+300 : YU%=MM(1)*10+300
8420 LPRINT X$;XU%;",",YU% : IF DD%(0)+DD%(1)=0 THEN GOTO 8435
8425 LPRINT "D";XU%+DD%(0);",",YU%+DD%(1)
8430 LPRINT "D";XU%-DD%(0);",",YU%-DD%(1) : LPRINT X$;XU%;",",YU%
8435 DD%(0)=0 : DD%(1)=0 : FST=1 : RETURN
8440 REM==<4> PLOT ALL VALUES OF ONE VARIABLE==
8445 IF LIG(0)*LIG(1)=0 THEN GOSUB 8070 : REM SET SCALES.
8450 J=1 : IF ABS(JMAX-1)<.0001 THEN GOTO 8460
8455 PRINT "PLOT WHICH VARIABLE: <1> TO <";JMAX;"> : INPUT J : FST=0
8460 LPRINT "L";BRO% : SG%=(J+1)*5 : LPRINT "B";SG%
8465 II=0 : FOR VV=0 TO IMAX : PNT(0)=XX(VV) : PNT(1)=YY(VV,J)
8470 FOR XY%=0 TO 1 : IF LIG(XY%)=2 THEN GOTO 8480

```

Continued

be numbered automatically. It then asks which variable to plot and draws the graph.

If OPTION <1> or <2> had been chosen, the same data would have been requested, but then axes would have been drawn and numbered. Option <1> produces one X and one Y axis and <2> draws a rectangle formed by identical scales along opposite sides of a box.

Once the scale data has been stored, a subsequent call to OPTION <4> to plot a variable would make plotting begin immediately. The stored axes, marks and numbers can be repeated without further inputs, by calling OPTION <3>. This is useful if the variables require separate plots.

New scales can be entered at any time by calling OPTION <1> or <2>. Thus the results can be test-plotted quickly on linear, log-linear or log-log scales of different sizes, without repeating the computation.

When the box or L shaped axes are used, it is sometimes necessary to draw a few grid lines across the plot at key positions. This may be done rapidly by using OPTION <6> or <7>. OPTION <6> will request the Y position, or <7> the X position and draw a line across the chart. The pen then returns to its starting point.

To save time when drawing a number of grid lines, an earlier version of the program drew alternate lines in opposite directions; however, it was found this produced slight variations in thickness, making the grid appear uneven.

The Graph Paper Option

Alternatively, a complete set of grid lines can be drawn automatically by calling the 'graph paper' OPTION <8>. This offers a choice between a grid line at every scale mark or only at the major marks. If the denser grid is chosen it is advisable to use thin lines and a light coloured ink. Thicker lines can be used for plotting the variables.

For different purposes, it's necessary to be able to change quickly between steel ball pens, different size fibre pens and Ball Pentels from 0.4 to 1.0 mm diameter, while keeping the writing point in the same place.

Using a jig, I've glued to each pen a light triangular collar drilled to slide over two vertical locating pins in a horizontal platform fitted below the plotter carriage. A quick-release spring holds the collar on the pins and firmly against the platform, positioning the pen in both the vertical and horizontal directions.

To complete the plot, you label the axes and the plotted lines. To do this, OPTION <5> calls up additional options which move the pen to some designated position and change the size, direction or thickness of the lettering or output ASCII characters. When thickened lines are re-

Listing 2 continued

```

8475 MM(XY%)=(PNT(XY%)-BS(XY%))/UPMM(XY%) : GOTO 8490
8480 IF SGN(PNT(XY%))>SGN(BS(XY%)) THEN GOTO 8515
8485 MM(XY%)=LOG(PNT(XY%)/BS(XY%))/LTM(XY%)
8490 IF EDG%=0 THEN GOTO 8510
8495 IF MM(XY%)<-.00001 THEN MM(XY%)=0 : FST=0 : II=1
8500 IF MM(XY%)>SCL(XY%) THEN MM(XY%)=SCL(XY%) : FST=0 : II=1
8510 NEXT XY% : IF II=0 THEN GOSUB 8410 : GOTO 8520
8515 PRINT "OFFSCALE POINT OMITTED"
8520 II=0 : IF OPT=0 THEN RETURN
8525 NEXT VV : LPRINT "F" : LPRINT "L";0 : GOTO 8000
8530 IF LIG(0)*LIG(1)=0 THEN GOSUB 8070 : REM==PLOT ONE POINT==
8535 REM ENTER WITH X&Y SET AND FST=0 FOR FIRST POINT ONLY.
8540 IF FST=0 THEN LPRINT CHR$(27); "Q"
8545 PNT(0)=X : PNT(1)=Y : OPT=0 : GOTO 8470
8550 HI%=0:PRINT " TYPE WORDS TO BE PRINTED, OR:-":REM=<S>WRITE WORDS ON PLOT=
8555 PRINT "MOVE PEN...<M>, CHANGE LETTER SIZE<S> OR DIRECTION<D>"
8560 PRINT "HEAVY PRINT<H>, LIGHT PRINT<L>(DEFAULT), EXIT.....<X>":INPUT S$
8565 IF S$="L" THEN GOTO 8550 ELSE IF S$="H" THEN HI%=1:GOTO 8555
8570 IF S$="S" THEN GOTO 8595 ELSE IF S$="D" THEN GOTO 8600
8575 IF S$="M" THEN GOTO 8605 ELSE IF S$="X" THEN GOTO 8615
8580 FOR II=27 TO 27+HI%*270 STEP 90:MM(0)=MM(2)+HI%*.25*COS(II/DTR)
8585 MM(1)=MM(3)+HI%*.25*SIN(II/DTR):FST=0:GOSUB 8410
8590 LPRINT "P";S$:NEXT II:GOTO 8555
8595 INPUT "LETTER SIZE <I> TO <15>";XU% :SU%=XU% : LPRINT "S";XU% : GOTO 8555
8600 INPUT "TOWARDS: +X<D>,+Y<I>,-X<D>,-Y<I>";XU% : LPRINT "Q";XU% : GOTO 8555
8605 INPUT "X IN MM=";MM(0) : INPUT "Y IN MM=";MM(1):MM(2)=MM(0):MM(3)=MM(1)
8610 FST=0 : GOSUB 8410 : GOTO 8555
8615 LPRINT "Q";0 : LPRINT "H" : LPRINT "S";3 : GOTO 8000
8620 IF LIG(0)*LIG(1)=0 THEN GOSUB 8070 : REM ==OPTIONS<G>&<7>==
8625 XY%=7-OPT : PRINT "TO RETURN TO OPTIONS, TYPE: .X CR"
8630 IF XY%=0 THEN INPUT "X UNITS=";S$ ELSE INPUT "Y UNITS=";S$
8635 VV=VAL(S$) : IF VV<0 THEN GOTO 8645
8640 IF S$="X" THEN LPRINT "H" : GOTO 8000
8645 MM(0)=0 : MM(1)=0 : IF LIG(XY%)=2 THEN GOTO 8655
8650 MM(XY%)=(VV-BS(XY%))/UPMM(XY%) : GOTO 8665
8655 IF SGN(VV)>SGN(BS(XY%)) THEN PRINT "OFFSCALE" : GOTO 8000
8660 MM(XY%)=LOG(VV/BS(XY%))/LTM(XY%)
8665 FST=0 : GOSUB 8410 : MM(1-XY%)=SCL(1-XY%) : GOSUB 8410
8670 FST=0 : MM(1-XY%)=0 : GOSUB 8410 : GOTO 8630

```

requested, the program writes the words four times with the letters slightly displaced.

OPTION <9> allows the operator to turn off or restore limits which prevent the pen from moving beyond the ends of the X or Y scales. When a point is outside these limits, the pen lifts and the message: OFFSCALE POINT OMITTED is displayed.

Interesting Parts Expanded

The edge limits may be used both to allow expansion of interesting parts of a graph and to prevent mishaps from driving the pen beyond the limits of the plotting

table. This displaces the scale positions and causes a noisy, but apparently not destructive, juddering.

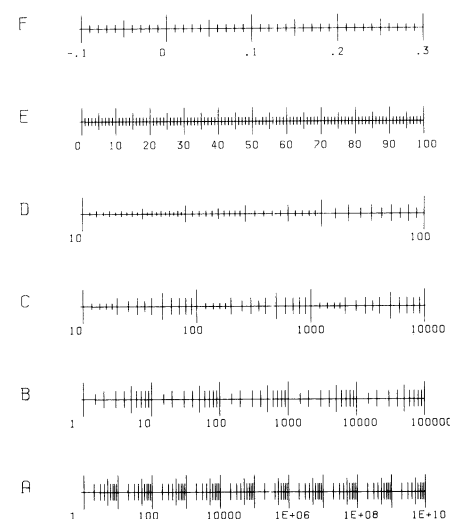
The program also includes a facility (not listed among the OPTIONS) for plotting individual points at the time each one is computed, as shown in the example given in Listing 3. This requires the plotting program to be used as a subroutine of the user's program, by replacing 8055 with the RETURN instruction in Listing 3. After each pair of values for X and Y have been computed, GOSUB 8530 will cause that point to be plotted.

To lift the pen before moving to the first point, FST must be set to zero in the user's

program. The program checks LIG() to confirm that the scale data has been entered. If not, it transfers to the input subroutine 8070-8140.

Logarithmic scales are specified by the number of mm per decade, which may range from less than 10 to above 1000. Figure 1 shows the way scale subdivisions are added or deleted by the program to suit longer or shorter decades. The program numbers log scales at the beginning of each decade unless the decades are too short, when some numbers will be omitted to prevent overlapping. Linear scales will be numbered automatically at the intervals specified and the user must allow sufficient space when asked: "NUMBER EVERY ? UNITS".

Figure 1



There are very few restrictions on the scales which may be specified. Linear scales may start or finish at any number or decimal fraction, positive or negative. Logarithmic scales also may start and finish at any points, but must be either positive or negative at both ends and must increase in absolute value from left to right or upwards.

As An Example...

To clarify the operation of the program, all the steps needed to produce the example shown in Figure 2 are set out below, together with the relevant line numbers from Listing 2.

Listing 1 simulates a typical user's program. When run, the arrays XX() and YY() are dimensioned and filled with results of a computation — in this case simple sinusoids. At 210 the plotting program is read in (CHAINED) and the arrays are made available to it through the COMMON statement 130. The screen then dis-

Listing 3. PLOTTER.BAS (Listing 2) may be used as a subroutine by replacing 8055 by the instruction shown in the following program.

```

100 REM= PLOTSUB.BAS = TESTS PLOTTER.BAS USED AS A SUBROUTINE.
110 GOSUB 8000 : REM INPUT SCALE DATA.
120 INPUT "NO. OF VARIABLES=";JMAX : INPUT "NO. OF VALUES=";IMAX
130 DIM XX(IMAX),YY(IMAX,JMAX)
140 REM==EXAMPLE:-
150 DTR=180/3.14159 : FOR J=1 TO JMAX
160 FST=0 : FOR I=0 TO IMAX : XX(I)=I : X=I
170 YY(I,J)=SIN(I*X/DTR) : Y=YY(I,J) : GOSUB 8530 : NEXT I : NEXT J
180 GOTO 100
8055 LPRINT CHR$(27); "P" : RETURN

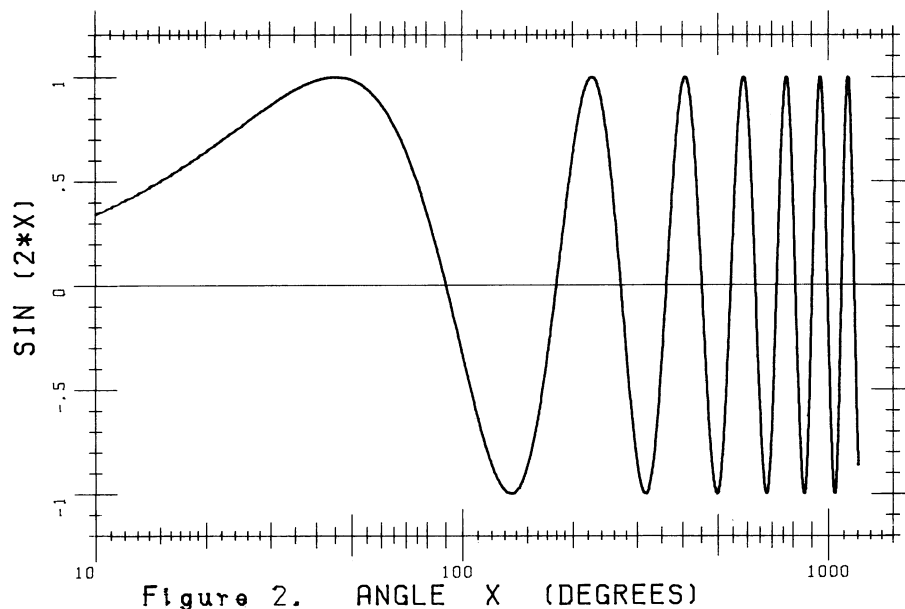
```

Figure 2 (right): An example of the 'box' scales marked and numbered by OPTION of the plotting program given in Listing 2. The curve is a sinusoid, plotted on a log scale by OPTION.

Figure 1 (at left): Examples of scales drawn and numbered by the plotting program, Listing 2.

A—D. Log scales having 10, 20, 33.3 and 100 mm per decade, showing changes in the subdivisions as the scales are expanded.

E and F. Typical linear scales. E, 1 unit/mm; F, 0.002 units/mm. (Figures 1 and 2 have been reduced in size during reproduction.)



KEYBOARD INPUT	COMMENT	LINE NOS
2 CR (Carriage Return.)	OPTION 2 Chosen.	8010
2 CR 70 CR	X-scale log., 70mm/decade	8075-8085
10 CR 1500 CR	Begin scale at 10 degrees, end scale at 1500 degrees.	8090-8095
1 CR .025 CR	Y-scale lin., 0.025 units/mm	8075-8080
-1.2 CR 1.2 CR	Begin at -1.2, end at 1.2	8090-8095
.1 CR .5 CR	Mark every .1, number every .5	8105-8110
Y CR	Yes, data is correct	8120-8405
4CR 2 CR	OPTION 4, plot variable 2	8440-8525
6CR O CR .X CR	OPT. 6. Draw grid line at Y=0	8620-8640
At this stage the graph is complete and the axes have been marked and numbered. If labels are needed on the axes, proceed:		
5CR .M CR 50 CR	OPT. 5. Move pen to X=50 mm	8550-8615
-16 CR .S CR 4 CR	Y=-16mm, letter size 4mm	
ANGLE X (DEGREES)	Write label for X-scale	
CR .M CR -12 CR 35	Move to X=-12 mm Y=35 mm	
CR .D CR 1 CR SIN (2*X)	Change direction to =Y, write	
CR .X CR 11 CR	Y-axis label, exit and return	

plays the OPTIONS shown in Listing 2, 8005-8045. From this point, the steps required to produce Figure 2 are as above:

While this procedure may appear complicated, it is made simple by the detailed prompts displayed when each OPTION is chosen. If a slightly heavier line is needed for the labels, then each may be typed twice. For example, by keying in: SIN (2*X) CR SIN (2*X) CR. The heavy print produced by .H CR is used chiefly for letters larger than 4 mm high.

Conversion and Modification

For conversion to other BASICs, first check the LPRINTS. These are used to pass commands to the plotter in ASCII form and to change over between the plotter (8005) and the printer (8055). Equivalent instructions for many well-known computers are set out in the plotter Applications Manual.

Next check CINT. Contrary to one popular text, this rounds to the nearest integer irrespective of sign, that is, CINT(-1.55)=-2. The % sign defines integer variables formed by rounding in the same way

as CINT. Many of the integers could be replaced by floating-point variables, as long as a margin is included to accommodate last-bit uncertainties.

As the plotting program (Listing 2) is in BASIC and is composed of largely independent sections, it should be relatively easy for users to modify it for particular purposes. The following notes may assist in making changes.

The data input (8065-8140), axis marking (8145-8330) and numbering (8335-8405) sections consist of loops traversed once for the X axis when the counter XY%=0 and once for the Y (XY%=1). XY% also serves as an index for data such as begin scale BS(), end scale ES(), units per mm UPMM(), distances in mm MM() and other variables.

The lengths of the bars across the axes may be changed easily. Bars extend DD%() tenths of a millimetre on each side of each axis. For linear scales the lengths are 7,12,25, and 50. (8185-8200). And for log scales: 5,9,16,25,40 and 50 (8275-8295).

Distances sent to the plotter are integral

tenths of a millimetre measured with reference to the lower-left corner of the table.

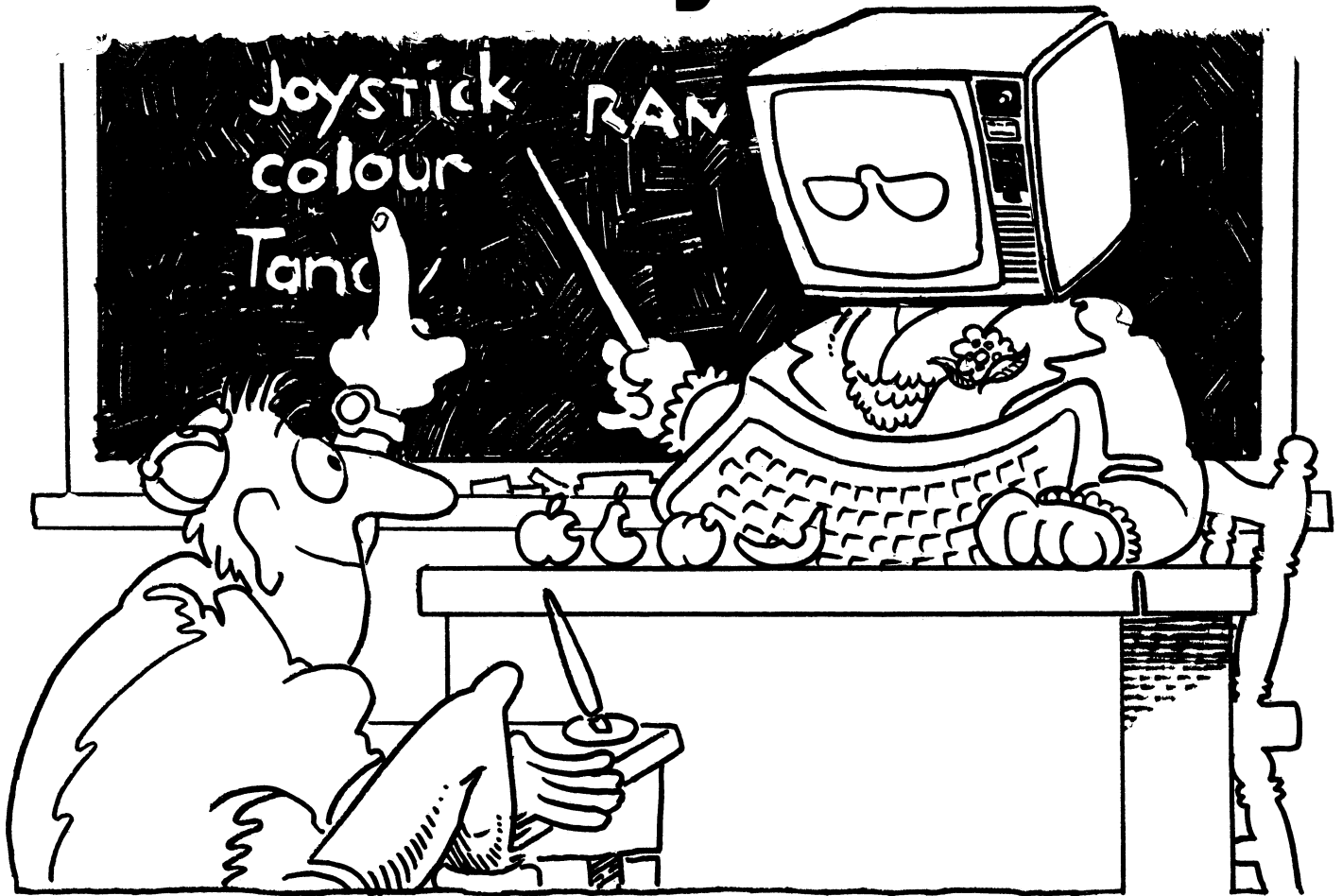
In the subroutine 8410-8435 this reference point is displaced 30 mm inwards to allow room for bars, numbers and labels. Elsewhere in the program all distances are related to this displaced zero. Therefore, the graphs could be moved about by changing the constants (300) in 8415.

Applications Of The Program

The usefulness of a plotter in association with a microcomputer is frequently overlooked. In addition to providing a compact record of computed results, graphical recordings can be made of the outputs of A/D converters, so voltages, sound levels, temperatures, air pollution levels and many other quantities can be presented in a convenient form.

For these purposes a microcomputer has the advantage, over a dedicated chart recorder, that transducer characteristics and corrections can be included. I hope this plotting program will prove useful both for these applications and for computed results.

A Beginner's Review Of Tandy Colour



COMPUTER illiteracy in the community is a big problem for the dozens of companies jostling for a share of the projected computer market of the '80s. "People have to be made aware, the public must be educated," comes the cry.

Well, you can't argue with that; but along with a lot of others I find playing around with a computer in a retail showroom, exposed to the contemptuous gaze of some spotty, post-pubescent sales-youth, not at all conducive to computer literacy.

The possibility of sudden interruption if inadvertently committing some atrocity on the hallowed hardware hardly serves to concentrate the mind. (Technically, this is known as *computus interruptus* — Ed.)

However, such acts perpetrated in the privacy of one's own home with the consent of the relevant computer company are something else again. So when Tandy offered examples of the TRS-80 Color Computer to interested journalists for home evaluation it was an opportunity to valuable to miss.

Tandy's Color Computer plugs into the domestic colour telly, has a pair of joysticks for spaceship control and the like, a standard typewriter keyboard and the odd function key. It uses nifty little ROM cartridges to load games and personal computing modules.

My unit had 16K of RAM and 4K ROM. That's not powerful by any standard, but the heart of a personal computer is not, as many would have us believe, its processor, but rather its user manual. This is where Tandy has really come up trumps. Forget all about ROM's, RAMs and bps, the novice buyer needs the aid of good, old-fashioned documentation. Despite what they tell you in computer shops, computers are not consumer items. You cannot take one home, plug it in and become an instant computer user, they demand a lot more of their masters than that: a good learner's manual may well determine whether a personal computer spends its time on the kitchen table or in a closet gathering dust.

Make sure the computer has a good manual first, then look at the hardware. Keeping in mind that the first purchase will probably be the wrong one anyway, the Tandy offering can't be too bad an option at \$600.

If All Else Fails...

The manual, *Getting started with Colour BASIC* is an excellent guide for the computer idiot. Well paced chapters feature friendly little line drawings and question and answer sessions. If the book could talk it would have a voice similar to an old primary school teacher of mine — I had to suppress an urge to run outside and play at the end of each chapter.

User friendly and interactive may be an appropriate way to describe it. It's designed to lock into the brain of an eight-year-old, so justifiably those of us who matriculated with only the aid of a slide rule really need to go back a few bases to gain a firm footing.

The guide illustrates the use of the computer's BASIC command, which resem-

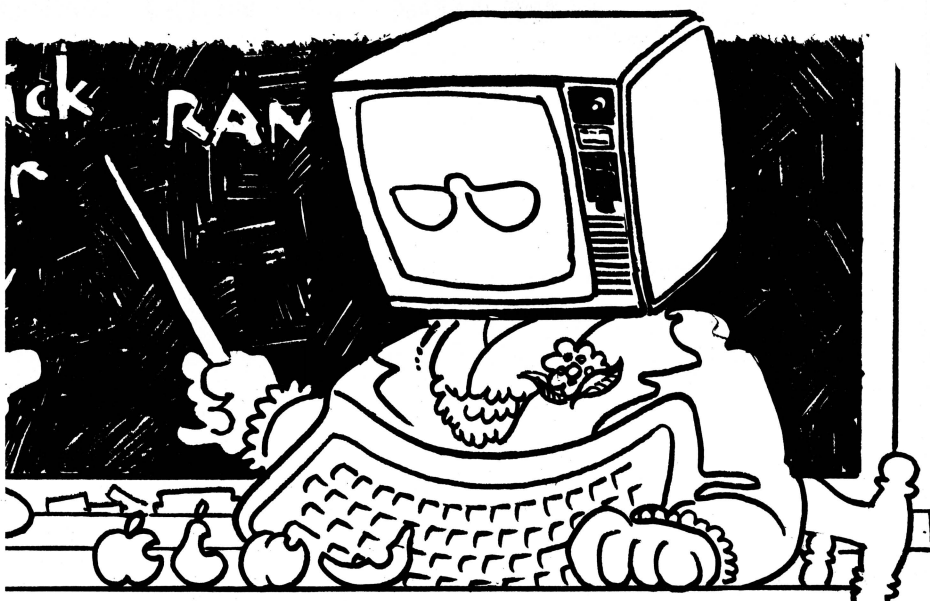
ble, I'm told, level two BASIC. The step-by-step instruction soon has the novice manipulating lines, drawing circles, running musical ditties — all against a background of easily programmed colour changes. It explains the why as well as the how too, so the learner gains a certain hazy understanding of the beast's inner workings as he goes along.

Once you have mastered the rudiments and the novelty of the games has run its course, it is possible to hook up a tape-recorder to preserve your programming masterpieces for posterity. If all goes well and the end of the book is reached, you can push on with a second tome called *Going ahead with extended Colour BASIC*.

... Read the Instructions

So what has the Tandy Color Computer have for the user once he knows how to use it? Well, Tandy has neatly straddled a number of markets with this one. It is a home-use unit with joy-stick for the kids to blast aliens and a personal finance package to keep track of bank balances and tax details. With the addition of printer and disk drives (both expected to be available), business packages and word processing become a possibility as well of course.

But it appears to me the real strength of



a product like this is the insight it can provide to the non-DP people who have to interface to some extent with the technology at work. Companies looking to find some way of familiarising staff with computing technology could probably do worse than buy half a dozen for the management to take home of an evening.

Computing IS simple, if you sneak up on it at your own pace.

Piece all the concepts together in the right order and the whole process becomes very clear; try to take short cuts and you're probably doomed. Starting from scratch with Tandy's Color Computer is an excellent way to become computer literate; you don't even have to force yourself — this particular novice saw the sun rise on the first session. . . Now if anyone out there has an IBM. . . ?

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HEARD ON THE BUS

By LEON YENDOR

ON A recent visit to the USA I couldn't help noticing just how much work is being done on and with operating systems similar to Bell Laboratories' UNIX (that's the telephone company, not our esteemed editor's back room!).

Anyone who knows my rigid views on standards and portability would think I'd be mightily pleased with an operating system which runs on many types of processor. Well, I have mixed feelings about some of the offerings.

You can tell almost immediately when most products are riding on the tail of a standard without meeting it. These days there are plenty of S-100 board advertisements which don't mention the IEEE standard or claim to be 'compatible' with boards meeting the standard. Similarly, the trendy claim to make is that your operating system is 'UNIX-like'.

With so much of this nonsense going on it was refreshing to hear Bill Plauger on his recent visit to Sydney. For the uninitiated, Plauger is one half of the Kernighan/Plauger team responsible for the book *Software Tools* — a work so valuable that fellow correspondent Bill Bolton has, as a mark of admiration, registered the name for his consultancy.

While Plauger's dissertation was on the products of his company, Whitesmiths of New York, it was much more enjoyable than any mere sales pitch could ever have been.

Linda To Follow Ada?

To a devout standardist like myself, it was as enjoyable to hear his solid endorsement of an absolute standard for UNIX type systems as it was to hear him propose the name Linda for the successor to the programming language Ada.

It was also enlightening to look at a number of processors from the viewpoint of someone who is very concerned with code efficiency.

Using the Digital Equipment PDP-11 as a reference point (say 100 percent code size), Plauger found the Motorola 68000 required about 130-135 percent and the Zilog Z8000 about 140 percent. The best result so far was from the VAX-11/780 (80 percent), while the real surprise was 85 percent from the Intel 8086.

Pertinent comments were also made about instruction sets and something I've felt for some time was reinforced. Plauger, asked why his company had no code generator for a Z80 in its C compiler, explained that one was available from another company. In running this compiler, Whitesmiths found it often generated up to 30 percent more code than the 8080 used. Sometimes a saving of up to ten percent might occur, but the added instructions of the Z80 were more apparent than real in value.

"When you see the instruction sets of processors illustrated by their makers, the code really sticks in your mind as a real advance," Plauger said.

He went on to explain that the reality was another story when in most situations the use of many of the tricks in the compiler was precluded.

Plauger On Compilers

Another question about C compilers and the lack of one for the Motorola 6800 elicited the opinion that although popular opinion has it that the 6800 fell behind the 8080 in sales due to a combination of being second onto the market and inferior promotion, this was not the case. In Plau-

ger's view a C compiler for the 6800 is not feasible.

"It is below C level," he said, explaining that although this might not have been obvious to all the programmers who rejected it, they would have had some feeling about ease of coding.

The only flaw in Plauger's presentation was a rather lame defence of Whitesmiths' choice of a C library which does not allow the use of the examples in the Kernighan and Ritchie definition of the language. True, the library is not part of the language standard, but when there is only one definitive work for tutorial use, I must argue for the inclusion in all libraries of all the functions needed to run the examples. Add whatever goodies you want, but if Leor Zolman can put them all in the BDS C compiler, one of the Bell alumnae can too.

Those of you interested in UNIX-like operating systems can obtain further information on UNIX itself from Bell Labs; information on Idris from Whitesmiths (I believe a company called Fawnray represents it here); on Coherent from the Mark Williams Company in Chicago and on Micronix from Morrow Designs, California. There are others, but in any case the important questions are: first, is the system 100 percent compatible with UNIX V6 (or V7 if you have a big machine) at the system call and library level; and second, does it maintain media interchange standards with PDP-11 UNIX V6.

Further information should be available in a forthcoming book from Osborne/McGraw-Hill called *A User's Guide To UNIX Systems*.

I may comment further on the book after I see it. □

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SUDDENLY the New Zealand data processing industry has surged ahead with the almost simultaneous announcement that David Reid Data Products has developed the Q-Series minicomputer in New Zealand.

Within a few days Microprocessor Developments announced that its New Zealand integrated MX series of microcomputers has been awarded the first substantial order for a New Zealand developed and assembled data processing system.

The order for a quarter of a million dollars worth of microcomputing systems came from a joint procurement collective, the Local Government Computer Joint Committee. This committee was established following recent advice by the Auditor General that the public sector should adopt comprehensive bulk buying schemes.

Significantly, in order to win the successful order for the MX series, the Auckland firm tendered against 24 other companies.

The MX microcomputers in the offices of these local bodies will act as multiprocessors. They will not be networked together, though the capability allows for networking during a further stage of development.

Individual systems are made up of a number of separate computers in the same cabinet. One of these computers monitors the rest of the integrated system. The full cabinet capacity is for 17 multiprocessors — the 17th being the monitor.

Each individual system comes equipped with between two and five screens. Each system will operate on a standardised program specially developed for this particular local body application.

The significance of the local body bulk buy is it represents the first occasion in which a New Zealand designed and developed system has met overseas competition head on, and won.

Microprocessor Developments managing director and David Reid Data Products managing director Frank Ollie claim that by the United States definition they are authentic computer manufacturers.

Computer Manufacturers Claim

"By the IBM definition we are computer manufacturers," asserts Frank Ollie.

"We put together chunks of made-up technology from many different manufacturers," points out John Lovelock.

They believe they deserve full man-

ufacturing status. This should certainly not be hard to fault in New Zealand where so many New Zealand "designed" and "manufactured" goods have neither been designed nor manufactured here at all; merely tooled together meccano style from overseas components or semi processed materials.

Take the David Reid Q-Series, for example. Parts were procured to a specific design to fit a specific New Zealand need. According to Frank Ollie this need is memory capacity rather than speed.

Ollie says IBM's contribution to its recently announced personal computer is only "in the packaging plus some minimal electronics, and of course the marketing. The rest of the computer is integrated from components made by other people."

"This is what we are doing with the Q-Series. It demonstrates just how fashionable integration has become in the computer industry," he says.

According to Ollie the New Zealand Q-Series had its beginnings in a visit to Japan in 1980. At the time Ollie was looking for something new in Winchester drives. But during his travels in Japan he came across a company specially created by the Japanese government to sell Japanese technology abroad under a degree of disguise. This company, it appears, is essentially a front for Hitachi and Fujitsu to export in a joint venture under a different name.

"When I saw this company was making products sold under the BASF and Memorex nameplates, I realised there was an opportunity for us too," recalls Ollie.

In the event, the Japanese company made the components for the basic Q-Series computer designed by David Reid. A United States company made the controller. The system was successfully 'integrated' during the 1981 National Computer Conference in Chicago.

Meanwhile, back home, David Reid attended to the case and the general styling, with particular attention to colour and the special Q livery and badge.

Ultimately, the point is that this breed of New Zealand computers are built to locally conceived specifications. Parts are procured or made to order, to fit these specifications.

Integrators And Assemblers

The 'integrators' in fact have much more right to call themselves manufacturers than, say, the New Zealand motor manufacturing industry which merely as-

sembles totally imported cars (except for some tyres and upholstery).

There are two sides to the manufacture/integration issue. There are the two leading integrators David Reid Data Products and Microprocessor Developments in Auckland. Then there is the Wellington-based Polycorp microcomputer operation which takes things even further, to the point of putting together the printed circuit boards here.

The John Lovelock/Frank Ollie argument is roughly this: by having no pretensions to having its own computer manufacturing industry, New Zealand is in the best possible position to take advantage of the international procurement opportunities.

"We are ideally placed to take advantage of the modern hardware being developed overseas," stresses MDL's Lovelock.

Whatever happens, the integration argument means New Zealand may be able to transfer to its own shores an increasing amount of the skill work, in systems production.

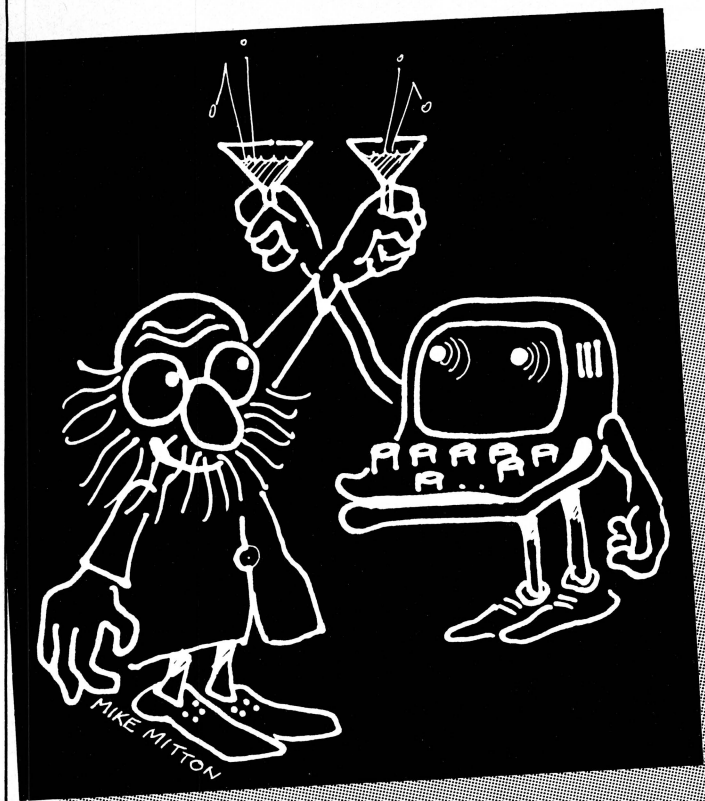
The development of New Zealand's own systems comes at a time when the smaller end of the market is in a degree of turmoil in New Zealand. Far too many models are now on the market — far too many exaggerated claims are made about capability.

Frank Ollie believes his new Q-Series will cut through much of the turmoil by offering plenty of memory rather than plenty of speed. Ollie is convinced that in the New Zealand commercial environment speed must take a back seat to memory. Indeed, he has loaded so much memory capability on the Q that at maximum loading it seems to be bumping into the back of the mainframes.

The local integrators are poised for substantial sales if there is one slight adjustment to the tariff arrangement. This would convert the 40 percent sales tax into a duty.

Surprisingly for a country so protective of local endeavour, regardless of local input all computers are levied the 40 percent tax unless they are sold to a government agency — such as schools, and hospitals. So currently, a local integrated product enjoys no special advantages.

Another indicator of the turmoil at the lower end of the market is the desire of mainframe or mini-companies to avoid the increasing costs of hand holding. This is certainly a factor behind the popularity of the DEC LSI/II, which is now being sold by computer houses in growing quantities. □



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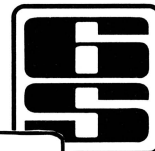
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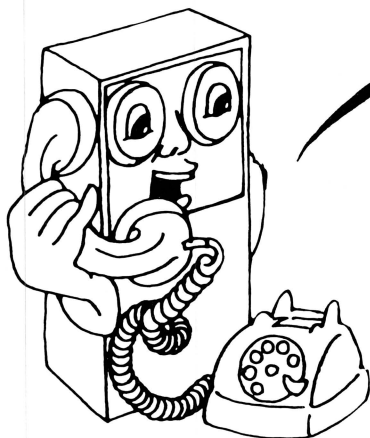
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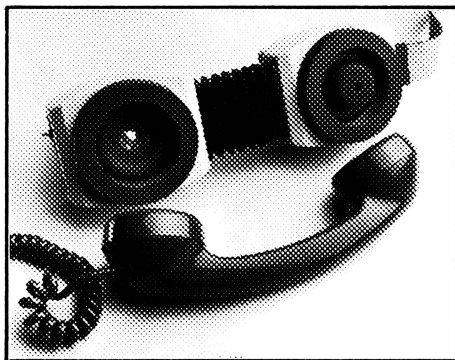


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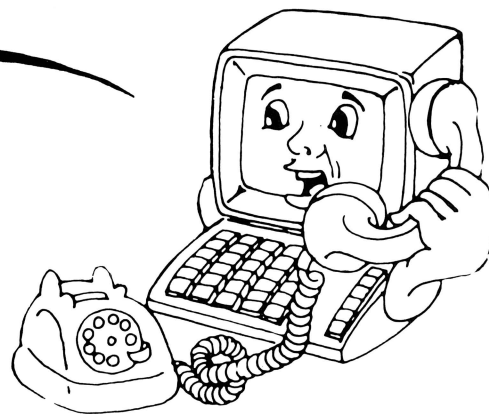


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AT THIS very moment, my Commodore VIC 20 is somewhere in transit between Sydney and Melbourne. Alas, as editorial deadlines must be adhered to, I cannot review the VIC 20 this month.

Fear not, my PET lovers, Errol The Cat is never lost for a Commodore product to review.

Dear old Commodore has just released its latest and possibly best machine — the SuperPet SP9000. This new model has been built around two microprocessors — the 6502, a Commodore standard, and the 6809, a faster and more powerful chip. A simple toggle switch on the cabinet's side transfers you from one to the other.

In 6502 mode, the standard PET BASIC with about 32K of user area is available. In 6809 mode, a menu designed by Waterloo Computing Systems is shown. The user is able to select APL, BASIC, FORTRAN, or Pascal. The requested language is then loaded from the system diskette in Drive 1; Drive 0 being available for a data diskette. About one minute

lapses and the machine is available for use. In the case of APL, the user is presented with a clear workspace and about 29K of work area.

The SuperPet looks like the 8032, having an 80 by 25 green display. The keyboard is a 73-key typewriter style, with standard upper/lower case, numeric keypad and full cursor control. The various software interpreters characters differently. Waterloo APL can view the character as an operator while Commodore BASIC may interpret it as a graphics character. In addition to the usual IEEE Port, two cassette ports and an 8-bit Parallel User Port, Commodore has added an RS232 port for asynchronous serial devices.

As a Cat knows very little about computer languages, a PET lover friend, Mr Dick Van Diggelen, has helped me with the SuperPet and the APL language. Dick is running some APL training courses in Sydney. They will last for 10 weeks, with two evenings at three hours each per

week. He can be contacted at Racqua, 27 Rutherford Avenue, Cronulla.

Dick tells me APL is pure magic. It was designed by Kenneth Iverson in the 1950s as a consistent, unifying system for mathematical notation, rather than computer language. Only recently has APL been available on micros, mainly due to the memory capacity required.

APL is consistent from one machine to another, so anyone learning on the SuperPet will have no problems in programming APL on other systems.

I strongly recommend all you PET lovers having a "sticky-beak" at the SuperPet. Your local Commodore dealer should have one.

Tasty Tidbits

A PET lover mate, Rod Cummings, has written the following program. It is a very simple method to check if your printer is on. Personally, I look at the on/off switch, but there are those around who need this little routine.

```
100 REM" *****
110 REM" ****      CHECK TO SEE IF PRINTER IS ON      ****
120 REM" ****      BY ROD CUMMINGS.                      ****
130 REM" *****
140 :
150 OPEN1,4                :REM"*****  OPEN FILE TO PRINTER
160 SYS61957                :REM"*****  CLEAR IEEE STATUS
170 SYS61957                :REM"*****  SEND 'LISTEN' TO PRINTER
180 PRINT#1,CHR$(0);        :REM"*****  PRINT NULL TO PRINTER
190 :
200 REM"*****  DISPLAY MESSAGE
210 :
220 IF ST = 0 THEN ST$ = "ON "
230 IF ST = -128 THEN ST$ = "OFF"
240 PRINT" THE PRINTER IS "; ST$
250 :
260 CLOSE1:GOTO150          :REM"*****  CLOSE FILE AND TRY AGAIN
270 :
READY.
```



Catty Comments

It seems the manufacturers of a recently released Japanese micro thought so much of the Australian market that they shipped the machines with 110V power supplies. Could it be the machines were intended for elsewhere?

For those readers lucky (or unlucky) enough to own an Apple III, you may like to know your machine has a monitor in ROM.

It's not mentioned in the literature, surprisingly, but the means of entering it gives a clue to the reason why. Simply hold down RESET and press another key. I won't tell you which key, but if you get it wrong it causes spectacular damage...

Computer Proverbs

My friends John Phillips, Robert Mitchell and Bill Saunders have helped me compile the following. We hope you find them amusing!

A spinning disk gathers no data.
Never count your records before they're hashed.

A patch in time causes another nine.
Never keep all your records in the one file.
A disk in the hand is subject to sticky finger marks.

It's no use closing the "and" gate after the "or" has bolted.

Pride in one's disk drive error recovery capabilities comes before a disk crash.
Scan ahead 100 instructions before the next GOTO.

The on/off switch is mightier than any sophisticated error recovery routine.
Indefinite WAIT states cause system hangups.

It's no use crying over corrupted, unbacked-up disks.

All for this month — Miaow from Errol The Cat. ☐

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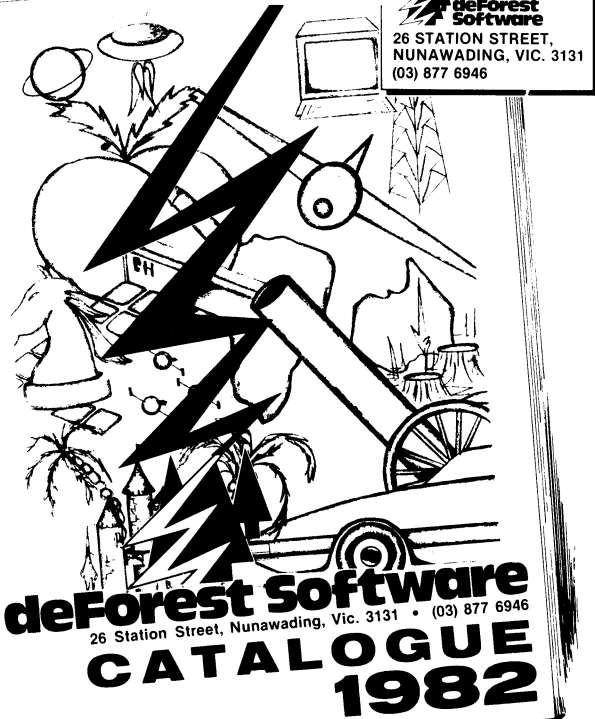
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CASE HISTORY

By Fred Symes

A MULTITUDE of component parts sourced from manufacturers in Adelaide, Melbourne, Sydney, Brisbane and Townsville, plus a field of operations stretching from Rockhampton to Cairns and east to Mt Isa, was creating all manner of problems for Shopfit Distributors, a young but rapidly developing company in the Queensland coastal town of Mackay.

Now these problems have been solved and the business made considerably more efficient by the installation of an Ohio C3 computer, a Mime 2A terminal and a printer.

A director of Shopfit Distributors, Mr Fleming, told *Your Computer* that since the system went on-line last August it had demonstrated considerable time and cost saving benefits and increased overall efficiency.

"It has afforded us tighter control of all aspects of the business and provided degrees of accuracy and speed in job quotations which we were unable to achieve manually," he said.

Mr Fleming said his company used a vast array of components from many manufacturers. Prices varied considerably with each manufacturer and were

constantly fluctuating, making it very difficult to quote with the necessary degree of accuracy.

Under a manual system it was extremely difficult to maintain an up-to-date record of prices and to know for sure which components were stocked by a particular supplier at any given time.

"Stock control, because it is so detailed, is very demanding. Before we started using the computer it required many man hours to categorise each aspect related to individual items," Mr Fleming continued.

Adding to the difficulties of a manual system was the rapidly growing volume of business. In its first year of operation the company's turnover reached \$250,000. Expansion is continuing at the same rate in its second year. This rapid rate resulted in too much time being expended on the mechanics of the company operation, leaving too little for getting the job done.

"The only solution was to computerise the business to free the staff for the handling of revenue-producing activities," added Mr Fleming.

He said Shopfit Distributors was now able to update suppliers' price changes in a few seconds and to produce statements

in 30 minutes, compared to the three days it took manually.

Another area in which the computer has proved invaluable has been the accurate costing of such items as freight costs, worker accommodation and travelling for jobs carried out away from Mackay. These cost factors were vital allocations in job quotations, Mr Fleming said, and the computer had implemented fast output of precise information in this area.

The Ohio C3 was supplied by Barry Judd and Company Electronic Systems, the North Queensland agents for the TCG Group.

TCG, in association with Dataflex Services, a Brisbane company providing computer consulting services to small businesses, has helped another Queensland company solve its job costing problems.

The system devised by Dataflex is called Jobcost III and, it is claimed, brings computerisation within the reach of the small business market previously untapped because of the high price of similar systems.

Priced at under \$12,000, Jobcost III is designed to provide a job costing and cost estimating system which will operate effectively in any business requiring the costing of a manufactured or assembled product, according to Dataflex managing director, Mr Serge Petelin.

After a five months' test with Marlin Modular Constructions, a Brisbane manufacturer of pre-fabricated buildings, Dataflex began marketing the package through TCG in the eastern states.

The software is designed to run on Ohio Scientific hardware — C4PDF, C8PDF or C3 with dual floppies and a polled keyboard or serial terminal. It will also support, without modification, Microline 80 or Epson MX80 printers.

Jobcost III will support a manufacturer or assembler which has up to 4000 stock items and will deliver quotations including up to 700 distinct items. It also allows the operator and his customer to easily analyse cost factors and to subsequently use the facts for effective and accurate management decisions.

The system provides a business with a summary of performance. Quote and cost variances can be fed into the computer to provide an analysis of the effectiveness of the costing procedure and, if it is breaking down, to pinpoint where and why. □



An Ohio Scientific C3—OEM computer has streamlined a demanding inventory control for Bob Fleming and partner Barbara Andrews of Shopfit Distributors, a Mackay shopfitting and industrial storage system design business.

your TRS80 computer

R.G. Stevenson

UNTIL the editor tires of me doing so in this I'll continue to draw on the feedback we get in the Adelaide Users' Group.

With over 120 members, I'd like to think this group is representative of my readership, and it appears to me to be the best way I can write to your needs.

Most comments seem to be of despair at the (alleged) lack of material for the newcomer to our hobby. It seems we all claim to be beginners, which is true in that some are less beginning beginners than others. And I can understand why there is a feeling of such loss when faced with the seemingly advanced stuff in magazines, and whenever computerists get together.

Yet I see this as a fallacy, grounded in the lack of confidence a newcomer naturally feels in company of those who've been into field for some time.

But I also believe it's unnecessary. My advice is to join (or start!) a club/group. No matter how new and innocent you are, you'll find just by being among more experienced people your knowledge and enjoyment will automatically grow.

It's a real waste to think you must attain some level of proficiency before attending and benefitting. Even the informal discussions which go on whenever people with like interests meet can't help but be beneficial.

You'll find even the 'high-powered experts' are approachable in this atmosphere and more than willing to help you to their level; their motivation may not be entirely selfless, since there will then be more discussion at their own level! I get tremendous stimulus, knowledge and understanding from the beginners' sessions (Assembly and Basic) I run within the Adelaide Group.

I strongly advise you to join a local group. If there isn't one, think about starting one (as I did in 1979 when I found there wasn't one in Adelaide). You don't have to be an expert; you'll find there's no end to the number of willing helpers once you initiate things and appeal for assistance. And there's a tremendous satisfaction in learning together, as well as the social input to a rather non-social activity like computing.

Beware, though: you'll quickly find there's not enough time in your day to do all the things you'll want to do with your computer.

Another word of warning. Don't try to go too fast. What has taken some of us four or five years to assimilate you could find indigestible if you're looking for it to be handed to you on a plate. I firmly support the old adage that you only get out of anything what you put into it.

Why Learn Programming

On the face of it, this seems a reasonable and unanswerable question with so many excellent (as well as many not so good) programs about. But what are the chances of you finding a program to do *exactly* what you want? And why should you compromise your ideas/wants/needs?

The answer of course is to lean enough about programming to be able to modify someone else's work. Indeed, I get my greatest satisfaction from modifying programs; when it runs completely to my satisfaction I'm no longer interested. Of course I'm realistic enough to understand this is probably a minority area of our hobby. But if you do need to get a job done (even if it is blowing up Klingons), wouldn't you rather do it *your* way?

Your ideas may be so far out that no one else would even think of wanting to write a program to do such a thing. Even greater scope for satisfaction here!

Why The Listings?

Have you ever looked at the pages and pages of listings of obscure programs in some magazines and books and wondered why?

No, it's not just to fill space easily! Once you get to the necessary level you'll find they're a most valuable as a source of ideas. Truly original ideas are probably the hardest thing to come by, in computing as anywhere.

The technique is to look at the listings and find a routine which appeals to you, then use the idea in your own masterpiece. Or perhaps you already had the idea but didn't know how to implement it.

I find it far easier to get true understanding from a listing (admittedly sometimes it does require real work because of lack of adequate documentation) than from some wordy explanation. Especially if the procedure is a little obscure/complex anyway.

If I tell you that to get your machine-code program to execute immediately the tape is loaded without having to press slash/enter, you can put the entry address into the video control block and restore it in your program; is it all clear? Or is it better to see it done in a program listing:

```
100  ORG      401EH      ;VIDEO DRIVER ADDRESS
110  DEFW    7FOOH      ;ENTRY-POINT OF PROGRAM
120  ORG      7FOOH      ;ACTUAL PROGRAM
130  LD      HL,401EH    ;RESTORE VIDEO DRIVER
140  LD      (HL),88     ;ORIGINAL VALUE
150  INC     HL
160  LD      (HL),4      ;ORIGINAL VALUE
```

So perhaps this is not exactly elementary? Whatever stage you're at, the same value is available from a study of listings.

If I tell you that to get INKEY\$ to accept

three-character input instead of the normal one-character you need just concatenate (link together: Penguin English Dictionary) three separate inputs, wouldn't you rather see it listed?

```
100 A1$=INKEY$:IFA1$=""THENGO100ELSEPRINTA1$;
110 A2$=INKEY$:IFA2$=""THENGO1010ELSEPRINTA2$;
120 A3$=INKEY$:IFA3$=""THENGO1020ELSEPRINTA3$;
130 A$=A1$+A2$+A3$:PRINT"YOU INPUT "A$
```

I'm not suggesting this is the ideal way of getting input, just using it to illustrate the point about the value of listings. One of my pet peeves is lack of input-checking — but more of this in a later episode.

RF Modulators

Having just had an opportunity to review the Tandy Color Computer, and finding the picture on my Sanyo Colour television totally unacceptable, I was moved to reflect on the unsuitability of these devices to replace the idea of a dedicated monitor.

Yes, I *know* the signal can be fed in directly instead of down the antenna lead via a modulator, but I wonder how many new-comers to our hobby do? And how many will be bitterly disappointed with their purchase (particularly of a Color Computer) when they see the picture their own television at home provides?

I know quite a few who believed the advertising about using their own television with a System 80/TRS-80, only to go out and buy a monitor shortly after. At around \$180 that's not too bad. But a colour monitor (or even a television which provides an acceptable definition and colour/tone reproduction) is decidedly more expensive than that.

All I'm suggesting is an acknowledgment in the advertisements that a television set will not do as good a job as a monitor. While I don't expect to get more than I pay for, unfortunately not all the world is as cynical.

Tape Systems

I am irritated by those who blindly accept the most horrendously annoying problems with their systems on the grounds that they can't afford disk. While there certainly are very real reasons for going to disk, the (erroneously alleged) unreliability of tape is definitely not one of them.

Or are you one of those who decide that, because you don't know how to work it, then it doesn't work? The precautions to take are so incredibly simple that I'm constantly amazed at this attitude.

In a future column (*perhaps article — Ed*) I'll expound on this subject at greater length. □

your SORCERER computer

Paul Beaver

WHY do people buy computers?

As much as I hate to admit it, I don't need my Sorcerer. I could get by without a word processor and that is the only valid reason I have for owning a computer. However, thank goodness, I do have a whole lot of invalid reasons. They break down into three rough categories.

Over the next couple of columns I'll try to explain these invalid reasons.

The first reason — and the reason that most people buy a computer — is entertainment. A computer is one of the most flexible entertainment machines around. There are arcade-type games, thought and strategy games and even board games, all of which will run on the same machine. You can't get bored with them because by the time you are sick of one another will turn up to grab your interest.

The second reason for owning a computer is education. This is the excuse you give to your wife/mother/girlfriend when she asks what you are spending all that money on.

Surprisingly, you can learn a lot with and from a computer. A computer is something *new* and anything new and different can be fun to learn about. Also, there are many programs which use the features of a computer to help teach you something.

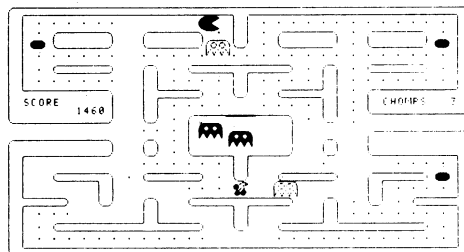
The third reason people give for buying computers is curiosity. Computers used to be something large and impersonal, sending you reminders to pay your bills. Now almost anyone can afford one, people buy them to see what all the fuss is about.

Back To The Games

I would like to talk about some of the games available for the Sorcerer computer. As there are so many, I will only talk about a few of the arcade-type games this time.

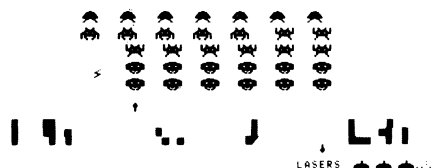
These are probably the most fun for those who are new to computers. All you have to do is load a tape program into the machine and play. There are no strange commands and almost no special knowledge of the computer needed.

Chomp, the ghost-muncher game, is a high-resolution game like the one you feed coins into at the arcade. This game has increasing levels of difficulty so even the expert will find it hard to beat. It has sound output through the parallel port.



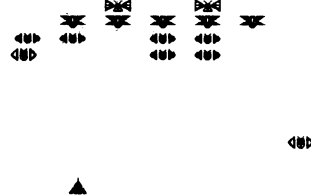
Sorcerer Invaders is a favourite arcade game played by everyone. There are several versions around, but this one has sound effects and again multiple levels of difficulties.

YOUR SCORE 2838 (HIGH SCORE) 1818 LAST UFO 8888



Galaxians is one of my favourite games. It's high-resolution and probably some of the best animations available on the Sorcerer. Once again there is sound output to the parallel port.

YOUR SCORE 2498 HIGH SCORE 3928 CREDITS 2

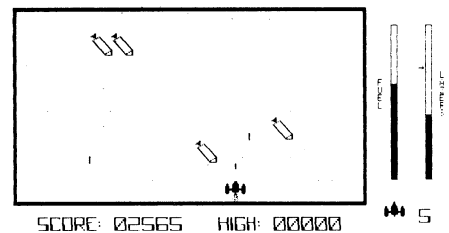


Sorcerer Super Asteroids is another copy of a favourite arcade game. It's worth mentioning because of the clarity of the graphics; there is no picture with this one but take my word for it, it's good.

And The New Ones...

There are two new games which have been sent to me to review. One of them, Astro Attack, has not been released as yet. It is a game with a series of different frames in each level. You must fight your way through each frame until you dock and refuel for the next level. Again there is

sound through the parallel port. I am sure that this will be one of the biggest-selling games ever for the Sorcerer.



The last game I will look at this time is Missile Defense. The graphics on this game are superb. It is another games machine look-alike, and well worth looking at.



My thanks to Systems Software and Global Software for supplying the above games for review.

All the games with sound can use the digital to analogue board that comes with the music program which I have previously reviewed. By the way, there is now an updated version of Music which allows the loading or saving of music files from disk as well as cassette. All you need is a disk system which runs CP/M 1.4 or higher.

Pundits Please

There have been several really bad puns and stories submitted to the Great Pun contest. One long and rambling story goes on about the digital musician who could only afford very poor quality disks. It seemed that no matter how fast he wrote songs and recorded them on the disks they would always lose data. Therefore, he was always de-composing!

Here is your chance to get a year's subscription to *Your Computer*, not to mention all the other benefits of being a member of the club. Send in your stinker, it just might win. See you next time. ☐



CONTINUING the assembler theme from the last OSI column (YC, February), we will now have a go at coding a simple machine code screen clear program.

You should have your *OS65D Disassembly Manual*, the *OSI Assembler/Editor users manual* and also a good machine code programming manual handy. I use the *MOS Technology 6500 Programming Manual*. It is a little dry, but very good — this is only to be expected as it was written by the 6502's designers.

The video screen on OSI systems is memory mapped, so to clear the screen we must put blanks in memory from the top left of the screen (\$D000) to the bottom right (\$D7FF), or in decimal from 53248 to 55295. The code for a blank space is decimal 32 or \$20, where the \$ denotes a hexadecimal number.

As most of you will be more familiar with BASIC than assembler, I'll give the equivalent program in BASIC, then show you how to code this in assembler.

The simplest BASIC program would probably be:

```
10 FOR Y = 53248 TO 55295 :
POKE Y, 32 : NEXT
```

Unfortunately, things are not that simple with the 6502 as its internal registers can only count from 0 to 255 decimal, or from 0 to \$FF hexadecimal. This does not make things too hard though: we just have to clear the screen in eight bunches of 256, instead of one of 2048, as in this program:

```
5 REM INITIALISE OUR VARIABLES AND COUNTER Y
10 BLANK = 32 : Y = 0
15 CLEAR THE SCREEN AT ALL 8 PLACES
20 POKE 53248 + Y, BLANK : REM $D000
30 POKE 53504 + Y, BLANK : REM $D100
40 POKE 53760 + Y, BLANK : REM $D200
50 POKE 54016 + Y, BLANK : REM $D300
60 POKE 54272 + Y, BLANK : REM $D400
70 POKE 54528 + Y, BLANK : REM $D500
80 POKE 54784 + Y, BLANK : REM $D600
90 POKE 55040 + Y, BLANK : REM $D700
95 REM ADD ONE TO OUR COUNTER
100 Y = Y + 1
105 REM SEE IF WE HAVE CLEARED ALL 256 LOCATIONS
110 IF Y < 256 THEN GOTO 20
```

If you run this basic program you will see how the screen is cleared in eight separate places, and you'll notice it takes nine seconds. This is why we wanted to try machine code: it will clear the screen in milliseconds as well-written machine code should run about 100 times faster than BASIC.

Assembler Program

Now to the assembler program. Here's a brief rundown on the machine code instructions used (op codes) to be used in conjunction with your programming manual.

PHA — PUSH ACCUMULATOR on the stack.

PLA — PULL ACCUMULATOR off the stack.

Don't worry about the stack too much, just think of the stack as a convenient way to store items. PHA puts it on the stack and PLA gets it back off.

TVA — TRANSFER Y REGISTER to

ACCUMULATOR

TAY — TRANSFER ACCUMULATOR to Y REGISTER

These four op codes are used to save and restore items on the stack. Good programming practice requires all registers changed in a subroutine be saved at the beginning and restored just before exiting. If this is not done very strange things can happen. Try running this program without lines 140, 150, 380 and 390, so the Y register is not saved.

LDA — LOAD the ACCUMULATOR

LDY — LOAD the Y REGISTER

When followed by a #, this loads the accumulator or register with the following number. In our program the accumulator is loaded with the code for a blank space and the Y register counter is set to zero.

STA — STORE THE ACCUMULATOR is equivalent to the BASIC POKE. The ', Y' suffix (indexed addressing) indicates that we add the value of the Y register to the address (\$D000 to \$D700) to cover all the 256 locations required. So here is our program:

```
10; OSI SCREEN CLEAR ROUTINE
20; BY GEOFF COHEN, Version 1.1, 6-1-1982
30;
40;
50 SPACE = $20
60;
70; START PROGRAM AT $5F00
80 * = $5F00
90;
100; SAVE ALL THE REGISTERS USED
110; (ACCUMULATOR AND Y REGISTER)
120;
130 PHA SAVE THE ACCUMULATOR
140 TVA SAVE THE Y REGISTER
150 PHA
160;
170; MAIN SCREEN CLEAR PROGRAM
180 LDY #00 SET Y REGISTER TO ZERO
190 LDA #SPACE ACCUMULATOR=SPACE
200;
210; CLEAR THE SCREEN, ONE PAGE AT A TIME
220; FROM $D000 TO $D700, PLUS THE VALUE
230; IN THE Y REGISTER (FROM 0 TO $FF OR 255)
240;
250 START STA D000,Y
260 STA D100,Y
270 STA D200,Y
280 STA D300,Y
290 STA D400,Y
300 STA D500,Y
310 STA D600,Y
320 STA D700,Y
330 INY
340 BNE START ADD ONE TO Y REGISTER
350; BRANCH IF Y NOT ZERO
360; RESTORE THE REGISTERS USED
370;
380 PLA RESTORE THE Y REGISTER
390 TAY
400 PLA RESTORE THE ACCUMULATOR
410;
420; RETURN TO YOUR PROGRAM
430 RTS.
```

The source code listing is nearly identical to the BASIC program and is composed of various sections. Note the semicolon (;) is the assembly equivalent of the REM statement. Lines 10 - 40 are the heading — quite important if you have lots of similar programs. A version number and date is also a good idea.

Line 50 sets the value of the blank pixel label, BLANK, and is the same as the BASIC BLANK=32. Line 80 sets the start of the program. The "*" is used by OSI to tell the assembler where the program should be placed in memory.

Lines 130 to 150 save the registers used in the program, and lines 380 to 400 restore them. Line 180 sets the Y register to zero and line 190 sets the accumulator to the value of BLANK. Lines 250 to 320 put the eight lots of blanks on the screen, while line 330 increments the counter — the Y register. Line 340 checks to see if the Y register is Zero. If not, it repeats the program by jumping to line 250 (START).

This checking for zero may seem odd at first, but as the Y register is only eight bits long, when it is incremented by one from 255 (\$FF) it becomes zero, not 256 (or

\$100). Thus the program loops through the eight screen clear lines with values of Y from zero to 255 (\$FF), then restores the registers used. Since the program is to be used as a subroutine, the end of the program is a RTS (RETURN from SUBROUTINE).

Forestalling Complaints

Now you have typed in the screen clear program, and (I hope) made two copies of it every few minutes, the program must be assembled and then stored on disk.

To forestall letters from the more expert programmers, this program and the way it is saved on disk is not necessarily the best, but it is the easiest for tyros to understand.

First, type 'A' to assemble the program and make sure you don't have any typing errors. Once this is okay, type 'H5D00' and then A3. As mentioned last month, this will put the program in memory, starting at \$5F0.

To save this program from memory, type !SA 06,3=5F00/1. This places the program on track 6, sector 3, which is normally not used (BASIC only uses sec-

tors 1 and 2). This enables you to save the screen clear without having to waste a track.

To use this in a BASIC program, put this line at the start of BEXEC*, or any program you need a screen clear in. . .

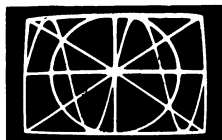
1 DISK!"CA 5FF00-06,3":POKE 133,94 where the POKE 133,94 prevents BASIC from using the screen clear space (for a 24K system). Now to use this screen clear in a program, put DISK!"FO 5FF00" and the marvellous 6502 will immediately jump to our screen clear subroutine, clear the screen and then return to BASIC.

Although this works and is good practice for machine code programming, it does use some RAM and needs some disk space to store it. I have a much more elegant version which uses some otherwise unused space in BASIC and replaces the redundant command LET with CLS. With this method you only need to type CLS anywhere in BASIC and the screen will clear in a flash.

If anyone with a disk wants more details on this, they should contact me via this magazine or OMEGA (see clubs page). □

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A WARM welcome to all Atari enthusiasts. In the coming months I'll be exploring better ways to use your Atari and enlarging on some of its unique features, such as player-missile graphics, display lists and interchangeable character sets.

I hope you will send me items which you think will be of interest to other Atari owners.

Extra Graphic Modes

The Atari has three extra graphics modes, accessible from BASIC, which are not documented in the BASIC reference manual. This is because the Australian PAL machine has a different display chip to the American NTSC machine.

The three modes are Graphics 9, Graphics 10 and Graphics 11. None of these modes is a split screen mode, so they cannot be used in BASIC's immediate execution mode. They may only be used from a BASIC program.

All three modes are 80 by 192 pixels (the pixels are flat rectangles).

Graphics 9 supports one colour and 16 intensities. SETCOLOR, with register 4, changes the colour of the background and of plotted points. The COLOR command, with a value from 0 to 15, changes the intensity of plotted points.

Graphics 10 allows you to display up to five colours at once. Try experimenting with different combinations of SETCOLOR and COLOR commands in this mode.

Graphics 11 supports up to 16 colours, all on one intensity. SETCOLOR, with register 4, can be used to change the colour of the background and of plotted points. The COLOR command, with a value of 0 to 16, changes the colour of points that are plotted.

The program below will display 15 different coloured bars on the screen:

```
10 GRAPHICS 11
20 SETCOLOR 4,0,5
30 FOR I= 1 to 15
40 COLOR I
50 PLOT 5*I+3,190
60 DRAWTO 5*I+3,0
70 DRAWTO 5*I,0
80 POSITION 5*I,190
90 POKE 765,I
100 XIO 18,#6,0,0,"S:
110 NEXT I
120 GOTO 120
```

Renumbering A BASIC Program

Here is a simple way to renumber a BASIC program, provided you have an Assembler Editor cartridge.

Save the BASIC program using the LIST command. Replace the BASIC cartridge with the Assembler Editor cartridge and load in the BASIC program using the ENTER command. The REN command can now be used to renumber the program.

Resave the program with the LIST command. It may be reloaded with the ENTER command after replacing the BASIC cartridge.

Note, however, that any GOTOs or GOSUBs in the program will have to be renumbered by hand.

Assembler Cartridge Fault

One problem owners of Atari's Assembler Editor cartridge will have found is that it's not possible to CLOAD object code created with the Assembler cartridge into the computer with the BASIC cartridge. (Object code is the code created by the ASM command with the Assembler cartridge).

The following program can be used to load object code with the BASIC cartridge:

```
100 TRAP 260
110 OPEN #3,4,0,"C:"
120 GET #3,X
130 GET #3,X
140 GET #3,X
150 GET #3,Y
160 ADSTART=256*Y+X
170 GET #3,X
180 GET #3,Y
190 APEND=256*Y+X
200 ADCUR=ADSTART
210 GET #3,X
220 POKE ADCUR,X
230 ADCUR=ADCUR+1
240 IF ADCUR<=APEND THEN 210
250 GOTO 140
260 CLOSE #3
270 END
```

Atari Users Group

An Atari Users Group has been formed in New South Wales. The group holds monthly meetings at which there are a variety of activities, such as talks on the Atari and presentation of new software.

For NSW readers, your local Atari stockist should have details of the next meeting.

Next month I will be discussing ways of generating alternative character sets which can be used to advantage in any programs. □

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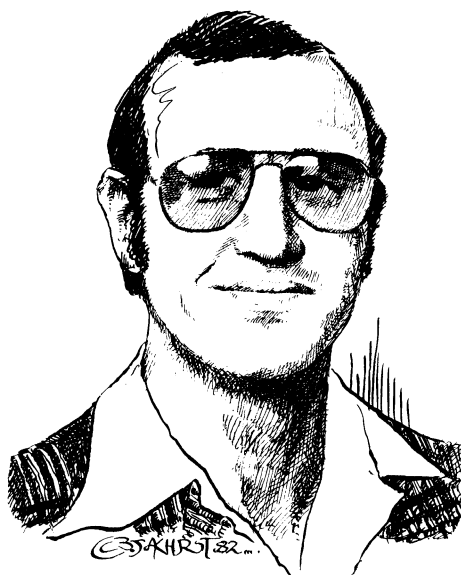
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TEXAS Instruments introduced a new peripheral expansion box for the 99/4 and the 99/4A home computer at a Consumers Electronics Show in Las Vegas.

The expansion box will house up to eight board-type peripheral cards, which will run off the mother-box power supply. The box, which measures 20 cm by 37 cm by 50 cm, has a high speed fan cooling system and is connected to the computer console by means of a shielded 44 pin connector cable. There is provision for the installation of one TI disk drive, while additional drives can be placed on top of or to the side of the peripheral expansion box.

The all-new peripheral cards will include the memory expansion 32K, RS 232 (a new parallel port has been added) and P-Code module. What does all this mean? For new 99/4A owners who do not have any of the old style peripheral boxes, it means a more compact computer system which can be added to at low cost.

For the hundreds who have at least one of the old style boxes, it means more bulk and more cost. Although the new peripheral expansion box can be plugged into any of the existing peripherals, we don't see why anyone would want to do so at a suggested retail cost of \$249.95.

TI has informed us that all production of the old style peripherals will stop and only the new expansion box and cards will be produced.

We strongly suggest that if you are thinking about adding to your present system and currently have one or more of the old style boxes, you do not delay in purchasing the additional peripherals you will need. If you do not own any of the old style peripherals, we advise you to wait for the new expansion system. New expan-

sion boxes and peripheral cards could be available as soon as a month in the US and a couple of months here in Australia. The suggested US retail prices are: Peripheral Expansion System, \$249.95; Memory Expansion Card (32K), \$299.95; P-Code card (requires 32K), \$249.95; Disk Controller Card, \$249.95; RS-232 Interface Card, \$174.95.

New Mini Memory

What just may be TI's most significant product release since the 99/4A was over-shadowed at the CES show in Las Vegas by the announcement of the Peripheral Expansion System. The new solid state Command Module, scheduled for release in April in the US, was shown for the first time by TI. Its name is Mini Memory.

Mini Memory features include:

- A total of 14K of memory, 6K GROM, 4K ROM and 4K RAM.
- A built-in battery which holds a program in memory for up to one year, even if the Command Module is removed from the computer.
- Additional files, aside from the 4K RAM file of the Mini Memory itself. If the Memory Expansion Unit is attached, it can be used by TI BASIC programs. This means you can use it to access the Memory Expansion which up to date could only be done with the Extended Basic Command Module (ROM Pack).
- With the Mini Memory, assembly language as well as BASIC programs can be loaded into the computer's memory.
- A line by line assembler is written into the Module so you can write from the console, a small assembly language program and execute it.

There are so many potential uses of the Mini Memory that you are only limited by your imagination in what can be used for. I feel the Mini Memory is a giant step in the right direction for improved usage of the 99/4 by both owners and the third party developers.

Suggested retail price of the Mini Memory in the US is \$99.95.

Other Command Modules (ROM Packs) recently been released by TI include Editor Assembler, \$85.00; Adventure, \$39.95; TI Invaders, \$39.95; Tombstone City, \$39.95; Car Wars, \$39.95 and Munch Man, price unknown.

Finally, commercial time... The TI 99/4 User Group's address is PO Box 101, Kings Cross, Sydney 2011 NSW. ☐

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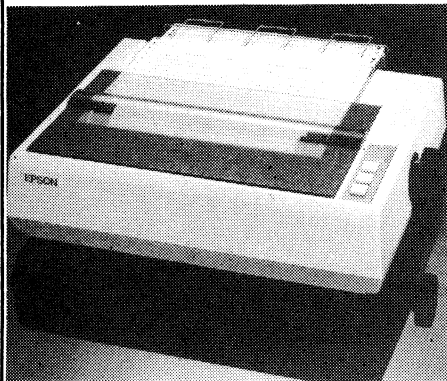
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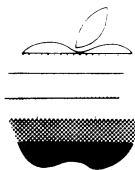
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